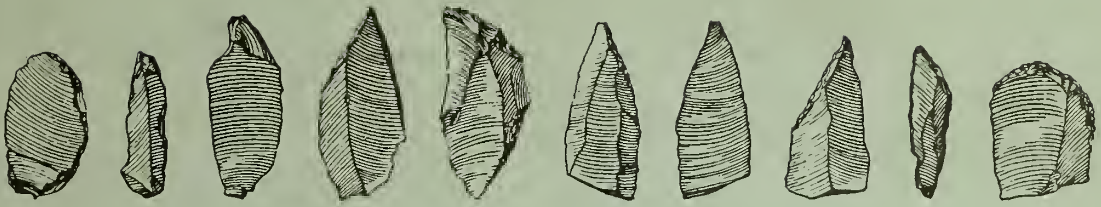
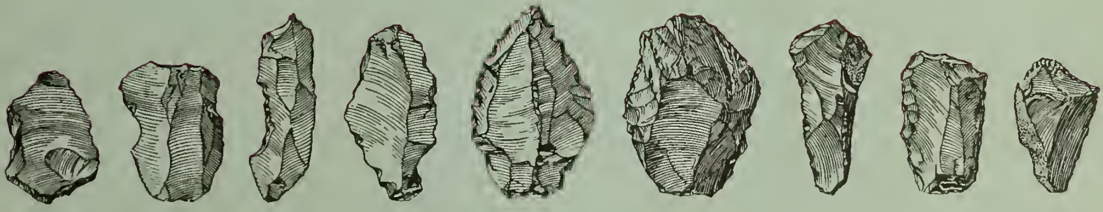


THE STONE AGE IN SCOTLAND

A. D. LACAILLE



THERE has long been a need for a synthesis of the geological and archaeological evidence bearing on the earliest colonization of Scotland by man. Published work on the subject dates back on the geological side to the great glaciologist James Geikie, while the archaeology is a comparatively recent development and is mainly the work of the author of the present book. Not only the publications but also the prehistoric materials themselves are scattered in many collections, often obscure; and it has been the author's purpose over many years to assemble the evidence and to prepare the necessary maps and illustrations. This book now puts together all that relates to the Quaternary Ice Age and the deglaciation, with the attendant phenomena by which Scotland was prepared for human occupation. It deals with the northward march of Palaeolithic man, and shows that nothing so far indicates that this extended beyond Yorkshire. Mr. Lacaille believes that this led to the establishment during the Boreal climatic phase (roughly between *c.* 6800 and 5000 B.C.) of a Mesolithic culture, the vestiges of which furnish the earliest evidence of man in Scotland. The various sources of man's immigration and the subsequent story of the settlers, whose economy was based on food-collecting, is deduced from relics found in deposits associated with the Early Post-Glacial sea, in caves and shell-mounds, on the banks of rivers and lakes, and in sand-dunes.

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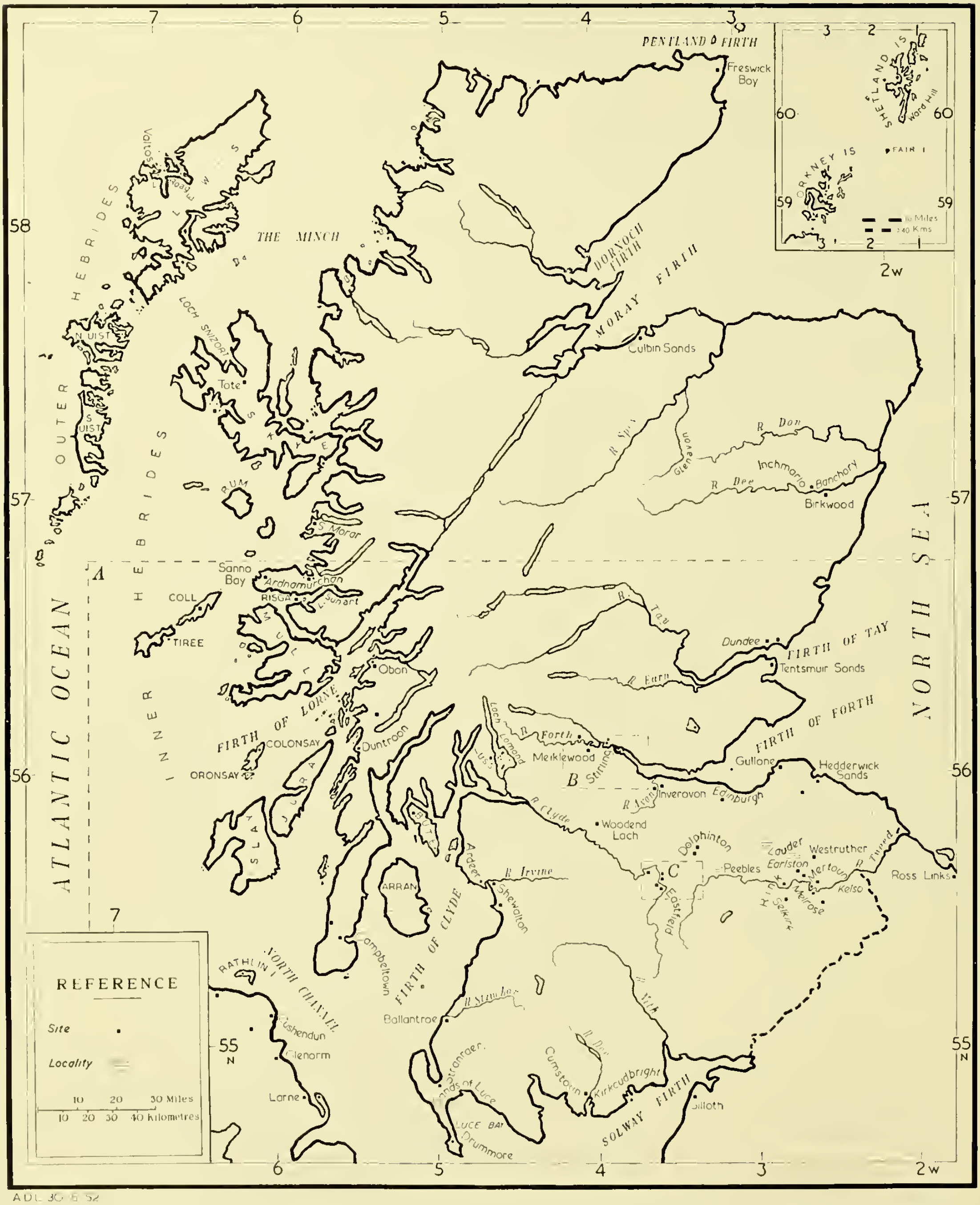

MAP OF SCOTLAND SHOWING SOME OF THE MAIN FINDING-PLACES OF RELICS OF STONE AGE CULTURE MENTIONED IN THE TEXT

The areas *A*, *B*, *C*, defined by broken lines, are covered respectively by maps on larger scales in Fig. 58, Fig. 64, and Fig. 73.

THE STONE AGE IN SCOTLAND

BY

A. D. LACAILLE

Archaeologist to The Wellcome Historical Medical Museum
London

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PREFACE

THE first great classic on Scottish archaeology was published a century ago. This was Sir Daniel Wilson's *The Archaeology and Prehistoric Annals of Scotland.* It has had few successors, yet each has in some way shown the individuality of the antiquities of Scotland. Of these works V. G. Childe's *The Prehistory of Scotland*, which appeared in 1935, was outstanding because it brought Scottish prehistory into line with the systems established as a result of international collaboration and research in archaeological studies between the two wars. In the long interval between these two books, Joseph Anderson (1883, 1886), Robert Munro (1898), and the Hon. John (later Lord) Abercromby (1912) published works which became standard.

There are many questions which are dealt with only briefly in these comprehensive manuals of Scottish archaeology. Some are discussed in monographs on regional prehistoric remains and their wider implications, on the geological background of the human story, on other aspects of the preparation of Scotland for man's settlement, and on artifacts constituting the earliest evidence of man's presence in this country. Yet there has so far been no work devoted solely to the earliest colonization of Scotland after the retreat of the Pleistocene ice-sheets and the final melting of the glaciers. Many years ago, when I considered the amount of material and the notes which I already possessed, and the first-hand knowledge which I had amassed from field-work, from the examination of public and private collections, from the study of published reports, and also from unpublished findings, it seemed that I was in a position to fill the need for a comprehensive work dealing with these problems. It should be mentioned that the broad deductions which I was able to draw from these Scottish studies were in part complementary, and often the sequel, to what I had learned from the investigation of Stone Age problems in England and on the Continent. I also concluded early that the relics of industry recognized to be among the oldest traces of man in Scotland could not continue to be designated by names which were used to describe certain prehistoric cultures of the Continent.

Between the two great wars a remarkable advance was made following recognition of the fact that archaeology, geology, and allied sciences are mutually interdependent in studies dealing with prehistory. During this time the Palaeolithic human cultures were placed upon a sound foundation. This by itself might be considered a very satisfactory achievement. But this co-operation between representatives of different sciences has gone even farther. It has shed light on the problems of the once nebulous early post-Pleistocene period which intervened between the close of the Palaeolithic Age and the advent of the Neolithic. The industrial elements, which during this period were brought by the settlers who are first known to have set foot in Scotland, belong to the complex of cultures which at this time were developing elsewhere from earlier stocks. During this intervening period, fittingly called the Mesolithic or Middle Stone Age, in regions of developing forests, on fenland islets, on the banks of lakes and rivers, on the shores of the sea and on estuaries, and in sandy areas, man continued the food-collecting habits and methods of his Palaeolithic forerunners. In the same way, the gradual growth of understanding of the Mesolithic Age in northern Europe is due very largely to the advance of palaeobotany and the wonderful technique of the pollen-analysis of peats. By its use the accurate determination of climatic changes has been made possible, and the results supplement and confirm those obtained by geological and other methods. For example, for the early Post-Glacial cultures and their associations in Baltic lands a grouping has been fixed which permits several chronological divisions. It is yet too early to draw up a similar scheme for Scotland. There is no doubt, however, that a sound sequence will eventually be established. Indeed, such researches in England and in Ireland have already given good results, and pioneer investigations indicate that Scotland is a field of great promise. Yet much work has still to be done before the details can be filled in to give a picture comparable with that of other regions which are in so many ways linked with Scotland. Nevertheless, the results which are now available enable me to advance this summary of the steps by which man reached Scotland and there planted a Mesolithic culture. It is hoped that it may be suggestive for future lines of research.

That so much is now known of the Mesolithic cultures of Britain south of the Tweed and Solway, and of Ireland, is due to the brilliant deductions drawn from the evidences of the surroundings which governed the development of various industries. Of the works which have been especially important to me, I would mention those of Professor J. G. D. Clark, of the University of Cambridge, to whom I am indebted for permission to reproduce illustrations from *The Mesolithic Age in Britain* (1932) and *The Meso-*

lithic Settlement of Northern Europe (1936). I owe a particular debt to *The Irish Stone Age* (1942), by Professor Hallam L. Movius, jun., Curator of Palaeolithic Archaeology in the University of Harvard, and formerly Assistant Director of the Harvard Archaeological Expeditions to Ireland. This work summarized the results of excavations carried out by modern methods, and the investigations of past and present students of coastal Late-Glacial and Early Post-Glacial deposits. It gave many standards for comparison and correlation, indicated what could be done in the Scottish field, and suggested the form of this book. I am glad to have this opportunity of expressing my warm gratitude to the author for his kindness, for his comments on sections of the text, and for permission to reproduce many figures from his own publications. It is a pleasant duty to record that much of my early work in the prehistory of Scotland was inspired and guided by the advice of two distinguished archaeologists, now deceased, Professor Thomas Hastie Bryce of the University of Glasgow, and Dr. John Graham Callander, Director of the National Museum of Antiquities of Scotland.

I look back upon a happy collaboration with Professor W. J. McCallien (now in the University of the Gold Coast) in the field of the Scottish Mesolithic. To him I am indebted for the use of illustrations and for an original drawing. Dr. M. MacGregor, lately Director of the Geological Survey of Scotland, discussed various questions with me and provided me with several drawings. I am grateful to Dr. G. W. Tyrrell, of the Department of Geology in the University of Glasgow, for help in the identification of rocks given me over many years. I also acknowledge the assistance received from Mr. C. P. Castell and Drs. L. R. Cox and W. J. Rees, of the British Museum (Natural History), in preparing lists of birds and molluscs. To Mr. T. C. Lethbridge, Honorary Keeper of Anglo-Saxon Antiquities, University Museum of Archaeology and Ethnology, Cambridge, I am indebted for permission to illustrate objects found by him and to reproduce some of his drawings. Dr. O. M. B. Bulman, Sedgwick Museum, Cambridge, kindly permitted me to reproduce illustrations of certain flint implements from the *Geological Magazine*, of which he is editor. Dr. O. G. S. Crawford, Editor of *Antiquity*, gave permission for reproduction of the map which appears as Fig. 64. To Mr. Henry Paton, Assistant Secretary of the Society of Antiquaries of Scotland, I am very grateful for assistance in the matter of illustrations. For valuable suggestions on parts of the text I am indebted to the following gentlemen: Dr. D. A. Allan, Director of the Royal Scottish Museum, Edinburgh; Mr. D. Baden-Powell, Oxford; Mr. Miles C. Burkitt, Cambridge; Professor V. G. Childe, University of London, who also supplied me with an illustration; and Dr. J. B. Simpson, of the Scottish Office of the Geological Survey, Edinburgh. Many years ago I was enabled to lay the foundations of these Scottish studies by a grant awarded by the Trustees of the late Lord Leverhulme.

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London, 23 September 1953 A. D. LACAILLE

I

THE NORTHERNMOST EVIDENCE OF PALAEOLITHIC MAN IN BRITAIN

1. INTRODUCTION

SCOTLAND can show no record of human occupation comparable to that of England and France. The first settlers of whom we have any knowledge arrived in early Post-Glacial times, and a long history therefore lies behind them. It includes that of Palaeolithic man's northward wanderings, governed by ice-movements during the Pleistocene epoch of the Quaternary era. This is often called the Ice Age because it was dominated by the most evident glaciation of all time.

The causes of the Quaternary Ice Age do not concern us, but its main phenomena may be summarized here. The glaciation was heralded during the preceding Pliocene epoch by increasingly cold conditions. These conditions were initiated in several Arctic centres where ice gathered, and from them it radiated. The main European focus of supply and dispersal lay in Fenno-Scandia over the northern Baltic region, and included the British Isles with their own areas of accumulation and distribution. In central and south-western Europe the high mountain ranges nourished glaciers, which filled the valleys and flowed down them to spread over the low grounds.

The glaciation did not produce one vast and united mass of ice, but it shrouded many regions. Though localized itself, its effects were world-wide. The Ice Age, however, was not one long period of stagnation, for several times immense ice-sheets advanced and retreated. Climatic changes attended these movements and had a profound effect on living forms. Some idea of how Britain was affected is necessary for a proper understanding of man's northward march and eventual arrival in Scotland.

Not long before the advent of the ice, north-western Europe was subjected to land-movements that reacted upon Scotland. The shores of that country extended farther out than they do now. Then they sank, so that at the beginning of the Quaternary the outline of Scotland resembled what it is today. Subsequent oscillations took place, and for long Britain was united to a European continent much larger than at present; and until about the middle of the epoch land connexions existed between Europe and Africa.

The Quaternary Ice Age, as the barrier between the living things of the past and the present, was a critical phase in Scotland's history. With its advent old forms of life vanished, and as it passed away new forms were introduced. Notwithstanding the fact that organic remains show that the ice loosened its grip at least once and then reasserted itself, they demonstrate the presence of life in Scotland only when the Pleistocene was far advanced. One can speak with more assurance of the general climatic improvement which accompanied the hesitating withdrawal of the ice, and which permitted the flora to develop and the fauna to immigrate. This climatic improvement was followed by the settlement of man in Scotland.

From the moment the importance of man's relation to the Ice Age was first recognized, an understanding of Pleistocene events became desirable. No problem, however, has more exercised geologists and others than that of the correlation of European ice-movements. On this subject an enormous amount has been written and the confusion of views is bewildering. Yet, when the work of Penck and Brückner on the glaciation of the Alps appeared (1909) it was thought that order had at last been reached. These disciples of James Geikie held that the Pleistocene consisted of four major glacial invasions, and they named them, in order of age, (I) Günz, (II) Mindel, (III) Riss, and (IV) Würm, after the Alpine valleys where each was best represented. They believed that these advances of the ice, during which the snow-line descended by about 1,200 to 1,300 metres, had been separated from one another by three retreats. Each of these gave rise to a period of interglacial climate, of which the second, between Mindel and Riss, was the longest.

The last (Würm) extension of the ice was twofold, a short retreat (Laufen) intervening between its maxima. It was followed by the Achen Recession which ushered in the withdrawal leading to the Post-Glacial period. The deglaciation was marked by halts and even readvances of the ice. Again using local names, Penck designated the principal interruptions (1) Bühl (now often called Würm III), (2) Gschnitz, and (3) Daun stadia. At these stages the snow-line in the Alps stood respectively at 900, 600, and 300 metres lower than today.

The human Palaeolithic cultures and their associations have been fitted into this scheme of glacial and interglacial periods put forward by Penck and Brückner. It has become increasingly clear, however, that, although broad correlations are indeed possible, palaeontology and human stages of cultural development cannot be made to conform to rigid divisions, the more since it is now recognized that each of the glaciations may have had more than one maximum, and that the interglacial periods were themselves interrupted by cold spells. Further, geographical and even chronological variations do not allow the Alpine system to be applied universally in Europe. For instance, the Alpine ice has left no evidence that it exerted such widespread influences as the ice-sheets born of Scandinavian glaciers. The action of these Scandinavian glaciers was very like that of the British flows, but on a far grander scale.

Great expanses of Europe, including France and the south of England, though never invaded by the ice, did not escape its influence. They underwent climatic and corresponding floral and faunal changes more or less pronounced according to their proximity to the ice. Early man, too, was greatly affected by these fluctuations, and with them his industries varied. The classic ground of the Thames valley is an example of such ice-free but periglacial regions. The deposits of its terraces and the steps between contain many memorials of the Pleistocene and provide standards for comparisons and correlations in Britain.[1]

The earlier glacial onslaughts, of which there is evidence in England, came from across the North Sea and assailed the east coast. It was, however, the ice fed by the Scottish snow-fields which predominated later in the British Isles. The glaciers, which then formed in the Highlands and Southern Uplands, crept out on both sides of the Scottish Midland Valley and coalesced. The records of the vast ice-sheet so formed reveal complicated movements in different directions, flows on occasion being opposed by powerful currents from other sources, and as a result splitting into widely diverging streams. Being constantly reinforced, the ice so waxed that it overrode the loftiest hills, eventually mantling most of the British Isles and spreading into the western ocean, probably as far as the edge of the Atlantic shelf, which corresponds to the 100-fathom submarine contour. Records of earlier ice-movements would very probably be destroyed in much of the territory shrouded during the great glaciation which involved most of the British Isles, and which is regarded as the equivalent of the first Würm advance of the Alpine glaciers. The Scottish ice was then

[1] King and Oakley, 1936.

confluent with that impelled from Scandinavia. Although this great extension of the north-western European ice-sheets may perhaps not have been coeval with the peak of the Würm I advance in the Alps, yet it seems to be the merging of local variations and to belong to the same phase of glacial intensity. Thenceforth the long reign of the ice in Scotland was punctuated by retreats and renewed advances, but for untold centuries the higher and north-westerly parts of that country lay buried.

Doubtless the succeeding lesser Alpine movements were due to the same general ruling cause which led to the final deglaciation of north-western Europe. In many of the affected regions the process was much the same, though not necessarily contemporaneous everywhere. Thus, ice continued to be active in mountainous countries long after more open territories had begun to enjoy post-glacial conditions. The great Scandinavian uplands and the Scottish Highlands are cases in point and have much in common, but here only the contrasts between Scotland and England need be considered. In Scotland glaciers and uncongenial conditions still lingered on, while in England a mixed fauna and human culture were spreading under an improving climate.

2. THE BRITISH DRIFTS

Where the ice held sway in the British Isles, its movements altered the face of the land, and are registered in the deposits of the Old (or Older), New (Newer or Younger), and Youngest Drifts.[1] The accompanying map (Fig. 1) shows the regions involved.

The area of the Old Drift lies between the sinuous line denoting the southernmost front of the ice in Britain, reached at the peak of the second glaciation, and the limits of the New Drift. In Old Drift territory memorials are preserved of ice-movements older than any positively recorded in the north of England, Wales, Scotland,[2] and most of Ireland. All that may be said at this stage is that the term Old Drift involves at least two glaciations, the intermediate limit between its maximum and the New Drift being as yet undetermined.

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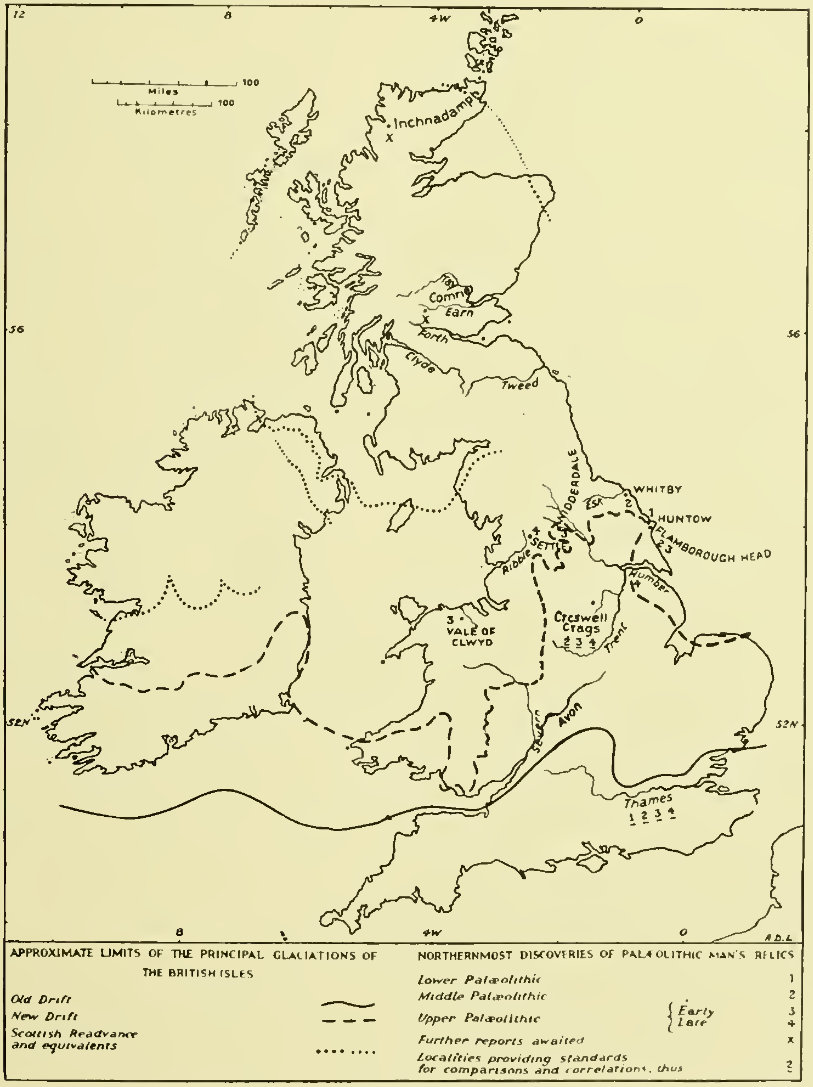
[1] Wright, 1937, pp. 74–102; 1939, pp. 28–32.

[2] Among the possible indicators of older glaciation are some shell-beds at Campbeltown (Wright, 1937, p. 368). An abraded Acheulian ovate of riebeckite-microgranite of Ailsa Craig type was found in Taplow Terrace gravels at Dawley, Middlesex (J. Allen Brown, 1895, pp. 159–60). From its facies and the conditions of its discovery there can be no doubt that the tool was fashioned long before the first recorded Scottish glaciation, which is equated here with Würm I. The artifact suggests that the raw material was carried south by an ice-movement earlier than that which scattered fragments of the characteristic rock of Ailsa Craig (Lacaille, 1936, pp. 615, 628).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NORTHERNMOST DISCOVERIES OF PALÆOLITHIC MAN'S RELICS
Lower Palæolithic 1
Middle Palæolithic 2
Upper Palæolithic Early 3
Late 4
Further reports awaited x
Localities providing standards for comparisons and correlations, thus 2

FIG. 1. Map showing the approximate limits of the principal glaciations of the British Isles, and the northernmost discoveries of Palaeolithic man's relics.

The denuded appearance and topography of the Old Drift contrast strikingly with the relatively fresh and varied surface of the New Drift, which may be traced across the south of Ireland and Wales, along the

Marches, in east Lancashire, over Yorkshire, along the east coast southward to the Wash and as far as Norfolk.[1] The deposits of the New Drift mark the last great advance of the ice-sheets and are late Pleistocene in age.

The Youngest (or lake-bearing) Drift records the last struggles of the dwindling ice. It belongs essentially to the mountains of north Wales and Ireland, the Lake District, and the Scottish western Southern Uplands and Highlands.

The difficulties in interpreting the complex character of the drifts are increased by the fact that records of interglacial periods, which occur where deposition was dominant, are seldom disclosed. Besides, the determining of advances is not easy, because successive forward steps of the ice may have ploughed through and obliterated deposits left in the trail of earlier movements. It is otherwise, of course, in the periglacial regions, where distinctions can be made. There, such layers as aggraded river terrace gravels are referable in the main to the later stages of interglacial periods, and solifluxion deposits to glacial episodes.

We must turn to the Baltic basin to find drifts which agree generally with the British Old and New series. There, too, the moraines, undrained hollows, and unsilted lakes, all products of the latest glacial activity, show features which may be compared with those produced in the final stages of the Ice Age in our Youngest Drift. That these similarities exist is not altogether strange because the British glaciation and deglaciation were largely concomitant with the growth and decrease of the Fenno-Scandian ice. Hence we look to the Baltic area rather than the Alps for correlative data. The key, however, appears to lie in the English North Midlands, where certain archaeological findings suggest agreement with the late Alpine scale.

Here we need only consider the chief events represented in the areas of the British drifts. To assess the implications of the various movements it is advisable to examine some aspects of life during the Ice Age.

3. THE PLEISTOCENE FAUNA AND MAN

It is improbable that any Scottish Pliocene floral and faunal remains escaped obliteration by Pleistocene ice-movements. Yet it may be supposed that pre-glacial life in Scotland was not unlike that farther south, because long before the Ice Age Scotland shared a genial climate with the rest of Britain and Europe.

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[1] Charlesworth, 1929, pp. 335 ff.

As the pre-glacial epoch ran its course so the climate grew colder until it became arctic. It can be imagined, therefore, that there were great changes in vegetation and migrations of animals as conditions developed to their climax. When the glaciation was at its maximum, life, which had steadily decreased as the cold intensified, virtually disappeared from the areas swept by ice. Naturally the conditions in the borderlands of these regions showed variations as the ice retreated and advanced.

An ideal succession of floral belts, each with its characteristic fauna, between a warm region with luxuriant vegetation and a lifeless ice-field would be: Forest; open country; grassy steppe broken occasionally by patches of bush; and barren tundra. The passage from the Pliocene warmth in south-east England to the peak of glaciation is such a record; it shows that ice-movements affected vegetation and through it the fauna.

As the ice drew back the sequence was naturally reversed. With subsequent advances and retreats the order was maintained, though we must allow for the fact that neither glacial intensity nor withdrawals were everywhere uniform or synchronous. Hence, animal remains, if sufficiently numerous and varied, help to determine whether milder periods were due to fluctuations of the ice-front or to true interglacial stages.

During the Pleistocene some animals deserted Britain, others became extinct, and new-comers appeared. Their environment can be deduced in some cases from analogy with creatures still living.

Animal and plant remains found in deposits throw light on surface conditions which formerly prevailed. Thus, one learns that different kinds of deer, horses, and oxen figured prominently during the Pleistocene. The imagination is stirred by the knowledge that a variety of large carnivores existed in Britain. This last group, however, is not particularly informative because the distribution of its species depended mainly on that of their prey. The most remarkable Pleistocene animals were the great pachyderms. Of these, the hippopotamus did not persist so long in Britain as the elephant and rhinoceros, both of which developed successively species adapted for life in a warm, a temperate, and finally an extremely cold climate.

The elephants are important chronological indicators. The warm southern type, *Elephas meridionalis* Nesti, characterized the Pliocene. It may later have been associated with another type, *E. trogontherii* Pohlig, intermediate between it and the straight-tusked *E. antiquus* Falc., which was essentially an animal of interglacial periods. In the cold-resisting and thick-haired mammoth, *E. primigenius* Blum., the form reached the height of its evolution.

The rhinoceros has not been so clearly defined, but the interglacial *Rhinoceros megarhinus* Christol and *R. hemitoechus* Falc. have been separated from the woolly form, *R. tichorhinus* Fischer, which was adapted for severe climates.

In time the mammoth and woolly rhinoceros were joined by the reindeer. This companionship, which seems to have been formed relatively late in south Britain, ended in Scotland.

Man also adapted himself to the rhythm of the Pleistocene. The archaeological and other evidence provided by the Thames valley and other periglacial regions points to the movements of the two Lower Palaeolithic human groups. These were the southern manufacturers of core-tools, who were associated with warm interglacial periods; and the makers of flake-implements from the east, associated with severe climates. During overlaps these people mingled and their industries blended, but in general the alternations held good until cultural elements fused before the coming of Upper Palaeolithic man.

The relationship between the Pleistocene mammals and Palaeolithic man, on the one hand, and the drifts of Britain, on the other, is gradually becoming clearer. Of course, mammalian life was impossible within close range of the ice. As the ice receded animals and man advanced into the freed territory, which they forsook for more congenial surroundings when the cold returned.

Man's northward wanderings in Britain with the Pleistocene animals can be traced by his industrial relics ranging from Lower to evolved Upper Palaeolithic, discovered in areas progressively made habitable by the withdrawal of the ice-sheets. So far, Palaeolithic man's trail cannot be certainly followed much beyond the North Midlands.

The succession of events in the Old Drift area, to which man and his animal companions adjusted themselves, agree broadly with the continental order.[1] This is not surprising, for England during the Pleistocene was but an extension of the northern French cultural province, and conditions were very similar in both regions.

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[1] Breuil, 1932.

4. THE LOWER PALAEOLITHIC AGE

Man probably coexisted in south Britain with the animals adapted respectively for the last warm, the temperate, and the cold periods before the first glacial episode, which is probably registered in the Red and Weybourne Crag and the oldest drift of the Chilterns. The real beginnings of human occupation in Britain, however, lie in the genial period that followed, when Abbevillian users of hand-axes roamed where they could with a warm fauna which had strong Pliocene affinities. Among these

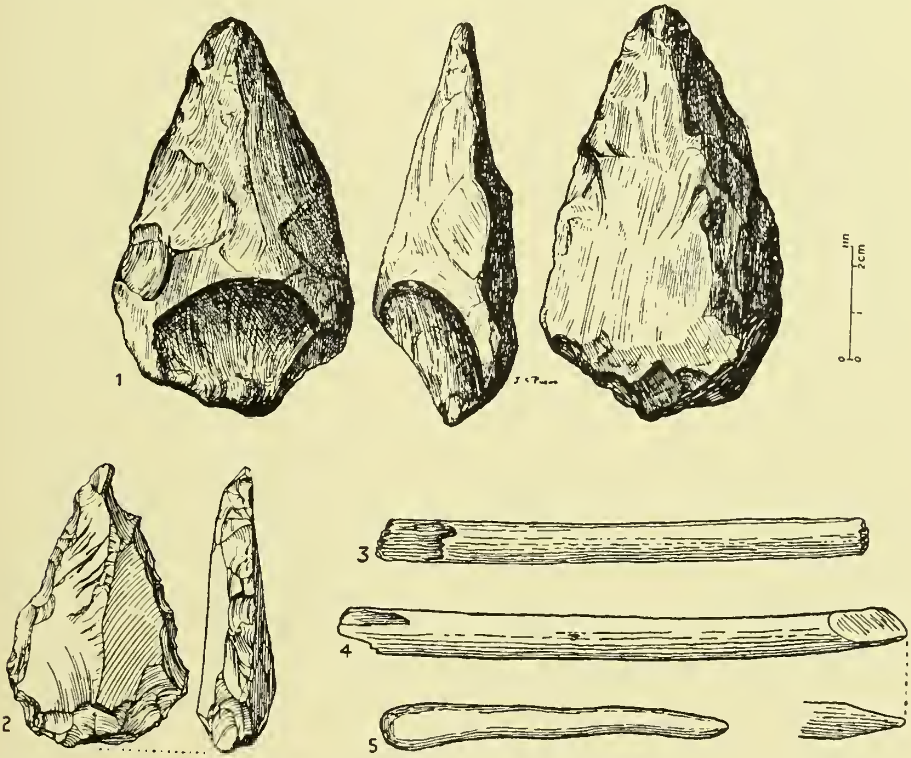

FIG. 2. Implements affording the most northerly evidences of Palaeolithic man in Britain. No. 1, Lower Palaeolithic, flint, Huntow, near Bridlington, Yorks. (After Elgee, 1930.) No. 2, Middle Palaeolithic, flint, Eskdale, near Whitby, Yorks. (After R. A. Smith, 1922.) Nos. 3–5, Upper Palaeolithic, reindeer antler, Settle, Yorks. (After Breuil, 1922.)

animals were the southern and straight-tusked elephants, the older types of rhinoceros, and the sabre-toothed tiger.

Gradually these conditions changed to cold as ice developed once more and advanced. This movement culminated in the farthest southerly extension of the ice in Britain. The hand-axe people and the warm fauna were forced back and replaced by Clactonian flake-implement makers and hardier animals. These Clactonians and their four-footed companions survived this glaciation, the deposits of which form the North Sea Drift, until the climate improved to such a degree that industrially more developed hand-axe makers, the Acheulians, and a moderately warm fauna succeeded them. Artifacts and organic remains show to what extent these new immigrants spread in England.

That the ice drew back far during this second interglacial period, the longest of the Pleistocene, is shown by discoveries of mammalian remains in the north of England. Among several sites in Yorkshire, the most northerly of all, the Victoria Cave, Settle, has yielded a bone of hippopotamus in derived and much-rolled condition with the vestiges of a much later fauna, probably contemporary with the containing deposit.[1] A claim for the human origin of a bone discovered here with the animal remains was challenged;[2] but a surface-found hand-axe (Fig. 2, no. 1) from Huntow, Bridlington,[3] and a worked flake from Chester[4] are evidence of man's movements beyond the Trent basin (including Lincolnshire[5] and Warwickshire)[6] during this mild period. Also, some stones from Nidderdale, Yorkshire, are claimed by their finder to have been flaked by Lower Palaeolithic man.[7]

It is just conceivable that Lower Palaeolithic man could have wandered farther, but a quartzite flake from County Durham,[8] advanced tentatively as evidence that he did so, is not convincing. Less attention need be paid to other claims. Informed opinion rejects the scarred and fractured stones which have been collected in the north of England, Scotland, and Ireland from coastal gravels, river-beds, and boulder clay and put forward as Lower Palaeolithic implements.[9] It sees nothing in such characteristic examples as are illustrated here (Fig. 3) but the products of Nature's different workshops and the victims of her transporting agencies.

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[1] J. Geikie, 1881, p. 97; Burkitt, 1921, p. 36.

[2] Ramsay, 1878, pp. 466–7.

[3] Elgee, 1930, p. 23.

[4] R. A. Smith, 1922, p. 26.

[5] Armstrong, 1939, pp. 91 ff.

[6] Shotton, 1930.

[7] Collins, 1930.

[8] Trechmann, 1928.

[9] F. Smith, 1909; Mann, 1936.

If any members of the fauna of the time strayed much farther north during this interglacial period, their bones would almost certainly have been destroyed by subsequent ice-movements, as also would have been the more fragile bones of man. Despite these considerations, there is always the remote chance that artifacts or organic remains of an early Lower Palaeolithic age may be preserved in exceptionally favourable situations such as an undiscovered cave.

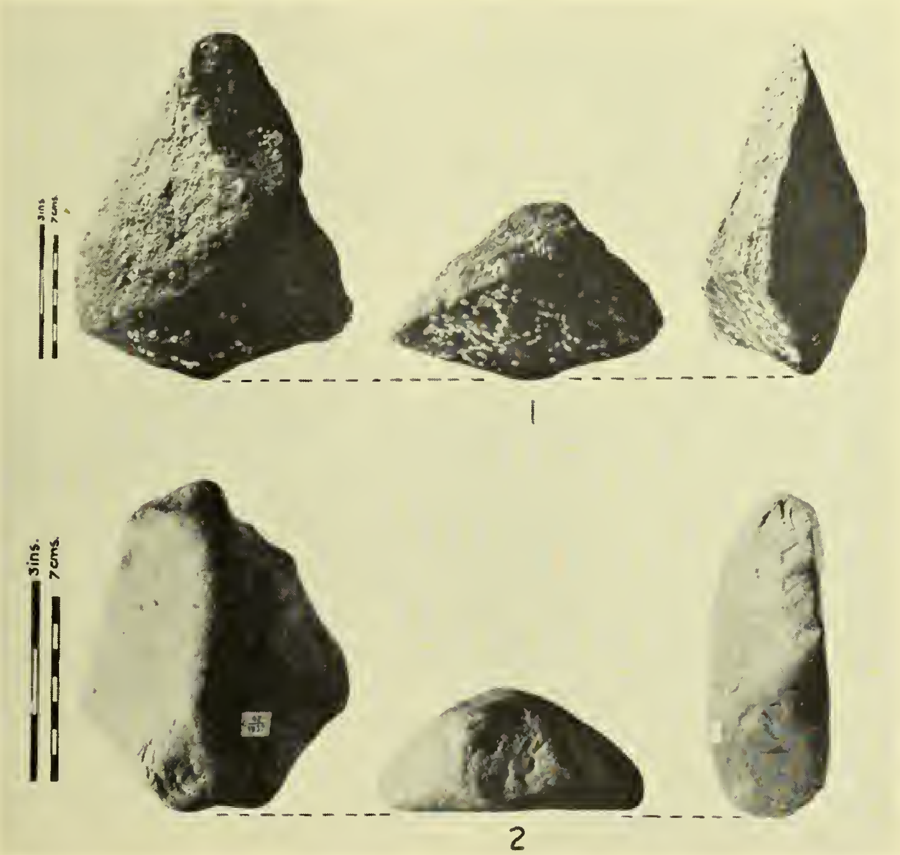

Fig. 3. Examples from Scotland of naturally fractured and scarred stones resembling Palaeolithic implements.
No. 1. Basalt; Doonfoot, Ayrshire;
No. 2. Quartzite, Crathes, Aberdeenshire.

The dearth of flint for making large tools has been put forward as an argument that Lower Palaeolithic man did not occupy the more northerly territory. This argument, however, cannot really stand, as countless palaeoliths fashioned in various hard rocks are found in many lands. Even among the relatively few artifacts which are evidence of early man's migration north of the Thames basin, the excess of tools worked in flint over those in quartzite and other rocks is not great. A weightier argument against man's northward migration is that small populations were not impelled to leave reasonably congenial regions for others which were probably less able to support an abundant animal life. Besides, the way was beset with many natural difficulties. The mountainous country where ice gathered, and such formidable obstacles as great rivers, must have discouraged migration.

When glacial conditions once more gripped the land many animals disappeared from Britain. But the career of Lower Palaeolithic man was not ended by this renewed onset of the ice, which is recorded by the Middle Chalky Boulder Clay of East Anglia. For a time the hand-axe folk gave place to the precursors of Middle Palaeolithic manufacturers of flake-implements, in the Clactonian tradition and in nascent Levalloisian style with Acheulian affinities. The temperate fauna, which had included later interglacial forms, yielded to cold-resisting animals; among these were early types of mammoth and woolly rhinoceros.

The deglaciation which followed was irregular. Since the ice withdrew but slowly, it is certain that its proximity made the Central Midlands long inhospitable. The region was not continuously uninhabitable, however, for a few Levalloisian flake-tool manufacturers, like their forerunners, wandered into the Trent basin. With them went the mammoth and the woolly rhinoceros. That such ill-equipped men ventured so far into the wastes beyond the bleak Thames valley of the time is indeed remarkable, but life was then adjusting itself to an era of refrigeration which was governed by the vast northern ice-fields.

A period of milder climate preceded the next glaciation, the evidence of which is so abundant in Scotland, the north of England, Wales, and Ireland. In the earlier part of the period the hand-axes that were again included in man's equipment consisted of highly evolved Acheulian types. Later, kindred implements were fashioned locally in south central and south and south-east Britain in even more developed Micoquian (final Acheulian) style.

5. THE MIDDLE PALAEOLITHIC AGE

Towards the end of the third interglacial period Lower Palaeolithic man disappeared. His Middle Palaeolithic successors came into their own, and for a considerable time preserved many of the old industrial traditions. The fauna and man can be traced with certainty as far as north-east Derbyshire, south-east Yorkshire, and perhaps north Wales, which suggests that little more territory was open in the north.

During this interglacial period the sea encroached upon the land, its transgression being registered by a raised beach. With its supporting platform this occurs from Yorkshire, around the south coast of England, in Wales, to Westmorland, and is represented in the Isle of Man. Its equivalent is also found along the north coast of France and in the Channel Islands. In Ireland it appears in County Down in the north-east, in the south, and in County Mayo in the west. The position of the zero-isobase, running from north-east England across to the west of Ireland, and the distribution of this beach south of it, preclude the beach from being confused with later strand-lines, but it has to be distinguished from pre-glacial examples at approximately similar levels. As the raised beach stands but 10 to 25 feet above present sea-level, and is only locally overlaid by glacial deposits, the coastlines of Britain during this interglacial period probably resembled those of the present day.

Our knowledge of the northward progress of the Pleistocene fauna and human industry from this interglacial period onward comes mainly from caves. Those excavated in the Creswell ravine, Derbyshire, afford a complete stratigraphical record which carries the story of man and beast from Middle Palaeolithic to early post-Palaeolithic times.[1] The sequence revealed here corresponds to the Alpine order of Penck and Brückner, and provides the basis of our correlations (pp. 26–29).

The Pin Hole Cave, Creswell, first records the sojourns of Middle Palaeolithic hunters sparingly equipped with flake-implements of evolved Clactonian facies (cf. *Tayacian*, early Mousterian)[2] and crude tools made in the Acheulian tradition. Among man's associates during the more genial phase of this interglacial period were the horse, bison, giant deer, and the lion.

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[1] Armstrong, 1925, 1931.

[2] These tools may be regional developments on the Clactonian and Levalloisian stock. It is unlikely that true (cave) Mousterian reached England, as it is unrepresented in northern France where Levalloisian takes its place.

6. THE GREAT GLACIATION OF SCOTLAND

Under the influence of the waxing northern ice interglacial conditions gave way, finally yielding to arctic rigours. In the south the glaciation was heralded by an increasingly severe climate, shown by floral vestiges and shells, bones of mammoth, woolly rhinoceros, reindeer, bison, horse, and rodents found in the peaty and marshy deposits of the Upper Flood Plain Terraces, Stage I (or the Ponder's End Stage), in the Thames valley.[1] Man is believed to be represented by a Late Levalloisian (Mousterian) flake-implement.[2]

The many great advances of the ice-sheets from different centres which marked this phase may not have attained their peak simultaneously. All, however, contributed to the considerable shrouding of the British Isles. To this stage belong the Upper Chalky Boulder Clay of East Anglia and the Yorkshire Lower Purple Drift.

The counterpart of the advance which then assailed England was the Great Scottish Glaciation whose main current moved south-easterly. The heavily charged till or basal boulder clay of the Midland Valley, in places proved to be of great thickness, shows the tremendous devastation wrought by the Scottish ice. But however powerful, this could not entirely overcome the pressure of the Scandinavian ice-sheets. In the Moray region the Highland ice was split into two flows, one towards the north and the other towards the south.

Abundant Scottish and Scandinavian erratics in English east coast drifts are evidence that the principal stream was in contact with the North Sea ice-sheets. Another flow formed the glutted Firth of Clyde glacier which coursed southward and united with the ice developed in Ireland. There the ravages of the concomitant glaciation are registered in the Indurated Boulder Clay.

Central and southern England, though spared direct invasion, fell under the influence of the advancing ice.

Eventually the intense cold was interrupted by a general shrinking of the ice-sheets. During the early phase of the thaw users of more developed Middle Palaeolithic tools were associated with a cold fauna at Creswell. Artifacts found on the coast of south-east Yorkshire[3] have been assigned to congeners of these people, to whom is ascribed a flake-implement of flint (Fig. 2, no. 2) recovered from boulder clay in Eskdale near Whitby.[1] These discoveries represent the most northerly advance of the Middle Palaeolithic folk.

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[1] Warren, 1912, 1916; King and Oakley, 1936, pp. 65–67.

[2] Burchell, 1935, p. 91.

[3] Idem, 1930 (*a*).

The records of subsequent events at Creswell were very similar to those prevailing on the Continent with which they may have synchronized. Thus, as the climate became milder, Middle Palaeolithic man gave way to representatives of *Homo sapiens* in the Upper Palaeolithic stage of cultural development.

7. THE UPPER PALAEOLITHIC AGE

Although southern and eastern England were now open to continuous human occupation, these regions were nevertheless influenced by subsequent readvances of the ice. Scotland, however, as the principal centre of these later movements, had still a long glacial history which was intimately bound up with that of the English north country, Wales, and Ireland.

Upper Palaeolithic hunters followed migrating herds across the land-bridge from the Continent, and small groups of them became scattered over south Britain. In time, bands in successive late stages of Aurignacian culture reached north-east Derbyshire. The Gravettian equipment of some of the last of these folk are found reinforced with Proto-Solutrean forms. At Creswell the relics of the earliest arrivals have been discovered with the remains of reindeer, mammoth, woolly rhinoceros, arctic hare, and variable hare. This type of fauna is suggestive of severe conditions. Later there came the horse, bison, red deer, and reindeer, an association which indicates climatic variations and seasonal migrations. Cold conditions apparently predominated, but man was able to make casual sojourns at open sites in north Lincolnshire.

Changes of sea-level connected with advances and retreats of the ice may have intermittently cut the direct communication with the Continent.[2] Hence, though reinforcing elements reached Britain, they infiltrated so slowly that by the time Magdalenian industries were flowering in France, after a return of cold following less uncongenial conditions, the relatively restricted area technically known as the English province had evolved an independent but basically Aurignacian culture.

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[1] R. A. Smith, 1922, p. 22; Elgee, 1930, pp. 36–37.

[2] Wright, 1937, p. 295.

The earlier cultural developments took place as the ice-sheets thinned and freed tracts of country as far north as the Scottish Midland Valley. Man apparently took little advantage of this liberation of territory. Yet relics proclaim that a few individuals ventured farther than the North Midlands; and artifacts of Aurignacian and Proto-Solutrean facies, associated with animal bones, are evidence of man's fleeting sojourn in the Vale of Clwyd, North Wales.[1] Early Upper Palaeolithic flint tools and surviving late Middle Palaeolithic forms have been claimed with remains of the mammoth, woolly rhinoceros, and reindeer near Flamborough Head.[2]

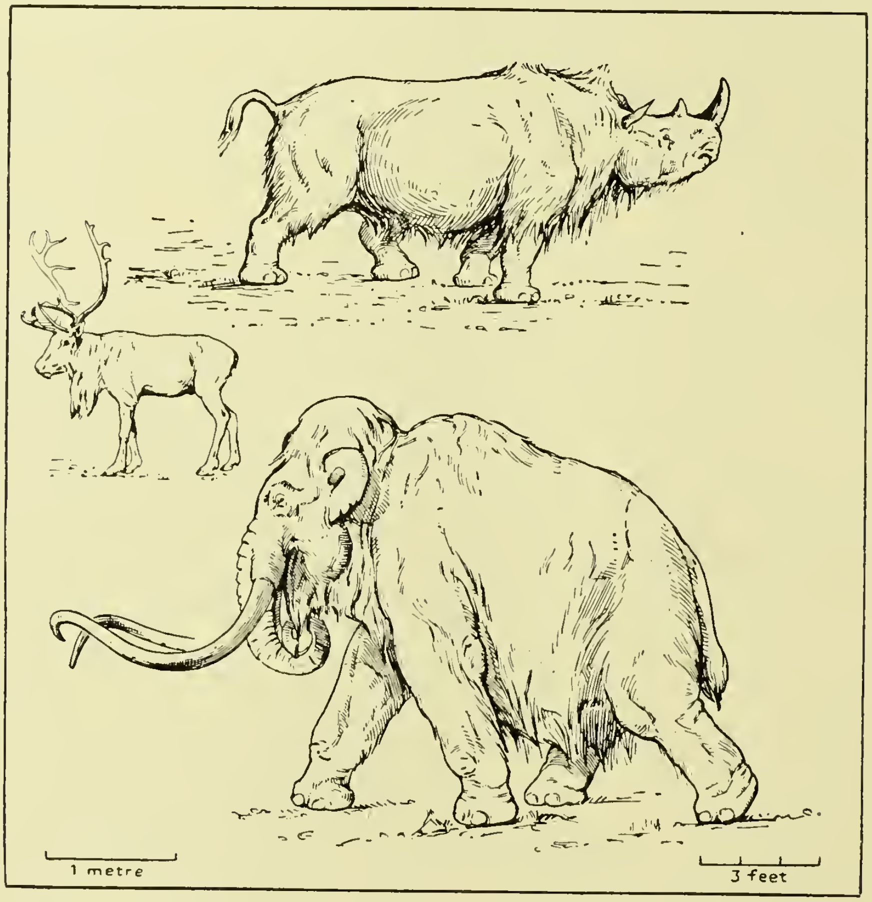

FIG. 4. Mammoth, woolly rhinoceros, and reindeer. (After Osborne, 1918.)

A number of man's contemporaries far outstripped him in their wanderings. Of the hardier forms, which probably sought more appropriate conditions, the mammoth and reindeer reached Ireland by a partial land-bridge due to an isostatic uplift,[1] and both accompanied the woolly rhinoceros into Scotland (Fig. 4). All three animals belonged to the fauna which was associated with late Middle Palaeolithic man, but which outlived him and spread south of the Humber during the stages of the cultural development of his successors. The evidence points also to the migration northwards of even less hardy forms during this period of climatic improvement. The remains of all these animals (Fig. 5) have been discovered over an area stretching from Ayrshire to Berwickshire (map, Fig. 6), but never beyond the River Forth.[2] This fauna, the first known to have penetrated into Scotland since the Ice Age began, is referable in archaeological chronology to Upper Palaeolithic times.

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[1] Garrod, 1926, pp. 104 ff.

[2] Burchell, 1930 (*b*).

The deposits formed in Scotland when the ice-sheets of the Great Glaciation melted back were mainly sands and gravels, sometimes with seams of clay and peat. The organic content of clay and peat has often provided valuable information, but that of the other deposits seldom. All deposits which cap those laid down by the great glaciation are significant. But, of course, the most interesting are the layers between the old and later boulder clays. Most sections owe their exposure to river cuts, and a number to the chance of commercial and engineering excavations. During the last century many of these sections attracted geologists, including the brothers Geikie, who described several examples in central Scotland. The valleys of Tweed and Clyde and of their tributaries provide innumerable cases. Some sections reveal aggraded fluviatile deposits comparable to those of England but on a small scale. Bores have also disclosed pre-glacial river channels charged with stratified beds resting upon the basal till, and overlaid with the boulder clay of the succeeding advance of the ice.

Besides an isolated record of mammoth from Dreghorn, Ayrshire,[3] tusks of this animal and reindeer antlers were obtained at Woodhill Quarry, Kilmaurs, in the same county.[4] They were associated with seeds of *Potamogeton perfoliatum* Linn., *Ranunculus aquatilis* Linn., and *Hippuris* sp., and the beetle *Notiophilus aquaticus* Linn, in an estuarine or fresh-

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[1] Charlesworth, 1930, p. 380.

[2] Ritchie, 1929, pp. 190–2.

[3] Ibid., p. 192.

[4] Bryce, 1865; Young and Craig, 1869; Bailey, Richey, Anderson, and MacGregor, A., 1930, pp. 325–30.

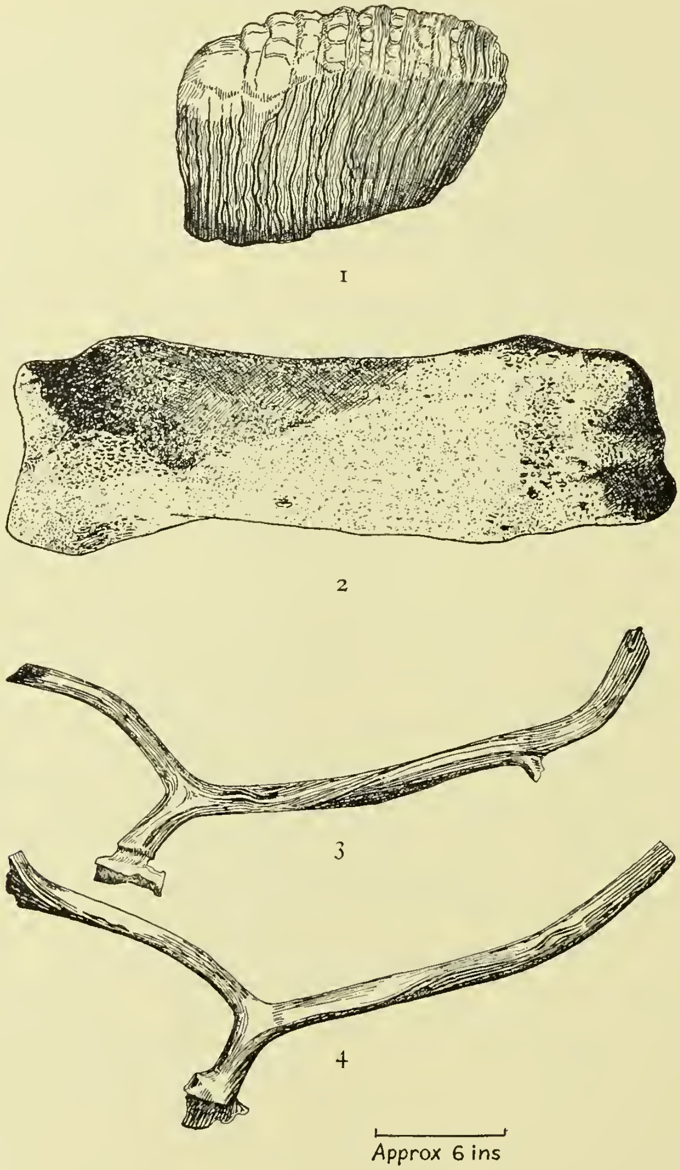

FIG. 5. Remains of mammoth, woolly rhinoceros, and reindeer found in central Scotland. (After McCallien, 1938.)

No. 1, right upper molar of mammoth from Bishopbriggs near Glasgow; No. 2, bone of woolly rhinoceros from Hungryside, Cadder, Dunbartonshire; Nos. 3 and 4, antlers of reindeer from Kilmaurs, Ayrshire.

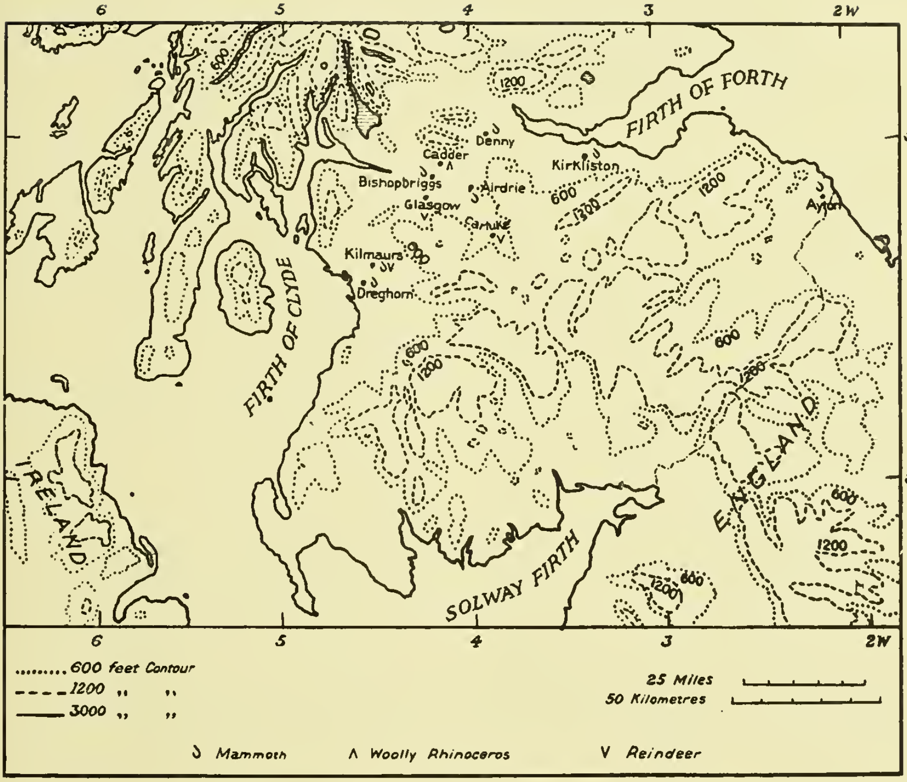

FIG. 6. Map showing the distribution in Scotland of mammalian remains, attributable to the period of climatic improvement between the Great Glaciation of Scotland and the New Drift.

water bed underlying a marine deposit containing foraminifera, ostracods, and shells of *Chlamys* [*Pecten*] *islandica* (Müller), *Macoma* [*Tellina*] *calcarea* (Gmelin), and *Leda oblonga* Sowerby (? *Yoldia arctica* Müller). This points to the transgression of a cold sea prior to the readvance of the ice responsible for the thick capping of boulder clays. The whole overlay a thin clay stratum, presumably an old land-surface, itself resting on the bedrock (Fig. 7).

Reindeer bones and antlers recently reported from the Queen's Park district of Glasgow have been ascribed to the interval of climatic improvement which accompanied this retreat of the ice.[1] These remains were recovered from a stream gravel underneath boulder clay, which in turn was overlaid with later arctic marine deposits.

Peat in a contorted layer between two boulder clays at Chapelhall, near Airdrie, a locality whence mammoth remains have come,[2] yielded insects, mosses, twigs, and branches,[3] including those of dwarf birch.[4]

Of the fossiliferous sediments farther east in Scotland which are referable to this period of deglaciation, two noted at Hailes, Midlothian,[5] are typical. One section (Fig. 8) showed a peat seam between two boulder clays. This peat contained remains of a decidedly temperate flora but none of animals, though their presence was suggested by vestiges of *Geotrupes stercorarius* Linn., a dung-inhabiting beetle (scarabaeid).

Equally instructive discoveries have been reported from the suburbs of Edinburgh. At Redhall Quarry, peat with associated deposits of sand and gravel between two boulder clays contained the remains of beetles, hazelnuts, oak, alder, Scots fir, and of no less than fifty flowering plants, some no longer native to Britain.[6] A sandy layer underlaid and overlaid by boulder clay at Craiglockhart Hill yielded tree-roots and other vegetable remains.[7]

Traces of plants and animals which lived between the great Scottish glaciation and its successor have sometimes, though rarely, been recovered from boulder clay and other glacial deposits in central Scotland. In their derived state the organic remains are invariably much injured and fragmentary. An example from the boulder clay is provided by an ice-scored piece of reindeer antler found at Raesgill, near Carluke, Lanarkshire.[8]

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[1] MacGregor and Ritchie, 1940.

[2] Ritchie, 1929.

[3] J. Geikie, 1894, p. 99.

[4] Dunlop, 1888.

[5] J. Geikie, 1881, pp. 256–61.

[6] Reid, 1888, pp. 181–2.

[7] Croll, 1875, p. 245.

[8] Gregory and Currie, 1928, p. 5.

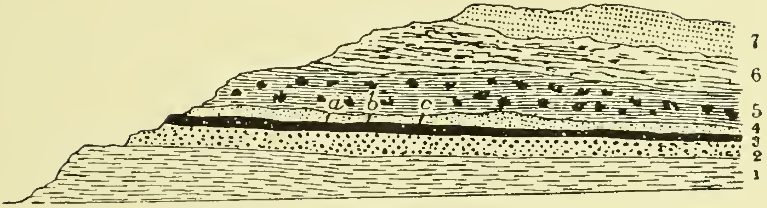

FIG. 7. Section in quarry at Kilmaurs, Ayrshire. (After Bryce, 1865.)

7. Surface soil.
6. Upper Drifts. } Attributable to the New Drift Glaciation.
5. Reddish-brown boulder clay. }
4. Coarse sand, a marine deposit containing shells, foraminifera, and ostracods indicating cold conditions.
3. Fine dark blue clay, a freshwater deposit containing remains of mammoth at *a* and *b* and of reindeer at *c*, plants, and beetle.
2. Hard gravel and clay.
1. Carboniferous sandstone.

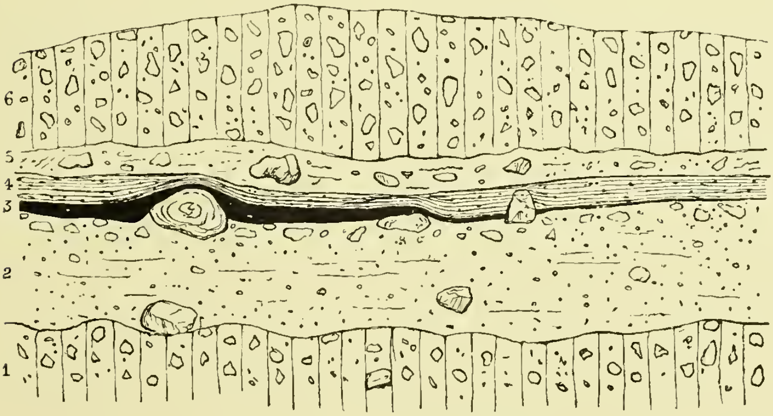

FIG. 8. Section in Hailes Quarry near Edinburgh. (After J. Geikie, 1881.)

6. Upper boulder clay, attributable to the New Drift Glaciation.
5. Coarse sandy clay containing angular and sub-angular stones and boulders.
4. Blue sandy clay locally intercalated with peat or sand and silt abundantly charged with plant remains.
3. Peat containing fragments of trees, apparently birch, with wing-cases of beetles.
2. Coarse earthy and gritty sand, with boulders most numerous at and near its upper surface.
1. Lower boulder clay, attributable to the Great Scottish Glaciation.

Glacial lake-gravels at Hungryside, Cadder, Dunbartonshire, have provided the only bone of the woolly rhinoceros which has so far been discovered in Scotland.[1] A morainic deposit at Headswood, near Denny, Stirlingshire, has recently yielded a molar tooth of the mammoth;[2] this represents the most northerly record of this animal in the British Isles.

It cannot be doubted that mammals could have lived farther north at this time, for the extensive deglaciation in the north-east of Scotland which is referred to this period[3] allowed a temperate flora to grow in that region. At the Burn of Benholm, Kincardineshire,[4] this is shown by the pollen-analysis of marshy peat between the grey basal boulder clay and the red boulder clay of the Strathmore Glaciation (New Drift). Alder and oak occur throughout, with pine and birch predominating in the lower part, and elm and hazel in the upper. That the ice had probably retired far back into the Highlands is indicated also by the presence of derived peat in Aberdeenshire moraines of the subsequent Strathmore Glaciation.[5]

The remains of animals and plants, the former few but the latter more numerous, demonstrate that during this period of retreat a cooler climate prevailed in western Scotland than in the east and north-east. From this the proximity of lingering ice in the west is inferred. Evidence from Northern Ireland shows that there were similar conditions.[6] In these regions, therefore, the climate would be that of an interstadial rather than an interglacial phase.

The Pleistocene animals were prevented from straying farther north by the great water-barrier formed by the junction of the Forth and Clyde estuaries.[7] Besides the sites in central Scotland which demonstrate the reality of the contemporary marine transgression, raised beaches and other deposits south of the Cheviots show that it affected other parts of Britain. The plants and animals represented in beds associated with the submergence in the more southerly regions point to temperate conditions approaching those of an interglacial.

Although man at this time could probably have trailed the animals farther north in Britain, there is no evidence that he did so. Moreover, he does not seem to have migrated to Ireland, the northern part of which was then ice-free and rich in flint which was excellent for the manufacture of implements. Though he would hardly have found any appreciable quantity of this rock in those parts of Scotland which were open, yet other and fairly tractable materials would have been available to him. That man may not have pushed beyond known sites can be accounted for in several ways. The most likely reason is that the chase of a few straggling animals would have offered the outposts of a tiny food-collecting population little inducement to leave fairly well-stocked regions. Despite these considerations, the possibility remains that man in a stage of *Late* Levalloisian ('Mousterian') or Aurignacian culture may have reached Ireland and some areas in central and southern Scotland. If his skeletal or industrial remains indeed exist, they await discovery as (*a*) comparatively unaltered ingredients in beds formed during the retreat stage that followed the Great Glaciation, or (*b*) as derived and abraded constituents of later deposits.

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[1] Swinton, 1927, p. 395.

[2] Absalom and Henderson, 1945.

[3] Bremner, 1934, p. 49.

[4] Campbell, 1934.

[5] Bremner, 1934, p. 18.

[6] Praeger, 1893.

[7] Ritchie, 1929, p. 192.

8. THE NEW DRIFT GLACIATION

Returning cold caused the less resistant members of the fauna to disappear from the outlying freed regions. Even the arctic forms which replaced them vanished in their turn as glaciation progressed. The great pachyderms died out in their last British feeding-grounds, which were overwhelmed by the readvance of the ice-sheets nurtured in the Highlands and other centres. These movements were highly intricate and made up the complex of the New Drift Glaciation.

This glaciation of the British Isles was not so extensive as its predecessor (map, Fig. 1), but it enveloped the whole of Scotland, the north of England, most of Wales and Ireland, and the ice at its maximum stretched into the Atlantic Ocean. Within the whole of this area only the loftiest hill-tops and some high masses remained uncovered.

From the principal gathering-ground in the Scottish Highlands the ice spread fanwise. The dominant constituent, the great Strathmore ice-sheet, invaded the Midland Valley and coalesced in central Scotland with ice impelled from the Southern Uplands. Ice-sheets once more bore across the North Sea, but in eastern and northern Scotland the native ice was powerful enough to fend off the assailing streams. Nevertheless, under the pressure offshore the trend of the Scottish flow was changed from south to north. The deflected currents involved Caithness and combined with the Scandinavian ice in oversweeping the Orkneys and Shetlands. Farther south, however, the North Sea ice exerted even greater influence. Along the seaboard it was in contact with Southern Uplands ice-streams moving over the Cheviots in a south-easterly direction. This is demonstrated by Scottish and Scandinavian erratics in English east coast deposits. Among these beds are the Hessle–Hunstanton and associated boulder clays, which also show that the onslaught of the northern ice stripped the coast from north of the Humber to the Wash, and was brought up against the Cromer Ridge in Norfolk. The counterpart of the Scottish glaciation in the English north country comprised advances of the ice east and west of the Pennines. The Cleveland Hills, however, stood out unglaciated in a region where great ice-lakes formed by the combined action of the Hessle and Scandinavian ice which dammed the Humber and the Vale of York.

Although not so vigorous as before, yet the Firth of Clyde glacier was constantly reinforced and succeeded in overriding the shores of Donegal, Antrim, and Down. It united with the ice which radiated from the Irish centre, but which spared a considerable expanse in the south. This is indicated by the distribution of the southern Irish End-Moraine. Ice urged from Scotland and Ireland filled the basin of the Irish Sea and invaded north Wales. In this country also there were active glaciers which contributed by their coalescence to the almost complete glaciation of the land.

Layers containing plant and animal remains of the retreat period preceding the New Drift have been found outside Scotland in areas vacated by the ice of the Great Glaciation. These beds, too, are capped by glacial deposits of the succeeding advance. The most significant stratigraphical evidence of man's northward march is that which shows the relationship of the New Drift Glaciation to Upper Palaeolithic cultural relics. It is crucial for dating and purposes of correlation.

The New Drift closed the mouths of the caves in the Vale of Clwyd, burying the Aurignacian and Proto-Solutrean products mentioned previously (p. 16). Hessle boulder clay, referable to this glaciation, covered the sediments which yielded Late Levalloisian and Aurignacian implements near Flamborough Head.[1] Presumably the boulder clay in Eskdale which has yielded a flint tool (Fig. 2, no. 2) is of similar origin.[2] Implements of Upper Palaeolithic type have been recovered also from glacial deposits attributed to the New Drift, at sites along the Humber,[3] Kirmington, Lincolnshire,[4] and Hunstanton, Norfolk.[5]

[1] Burchell, 1930(*b*), pp. 374–80; 1930(*a*), p. 226; 1931, p. 267.

[2] R. A. Smith, 1922, pp. 36–37.

[3] Burchell and Moir, 1935, pp. 130–2.

[4] Burchell, 1931, pp. 262–72; 1933.

[5] Moir, 1930, pp. 366–8.

Just on the outer fringe of the New Drift, outwash material from the end-moraine was deposited on the Upper Palaeolithic implements reported from Gouthwaite Reservoir in Nidderdale, Yorkshire.[1] Some Upper Palaeolithic sites outside the immediate scope of the New Drift lay sufficiently near ice-swept territory to be sensibly affected. Among them the open-air stations in north Lincolnshire were burdened with solifluxion masses assignable to this glaciation.[2] By its action the Upper Palaeolithic layers in the Pin Hole Cave, Creswell, were sealed and the place rendered uninhabitable.

Bitterly cold and wet as was the Creswell Crags region at the peak of the New Drift Glaciation, and boasting only a scanty arctic fauna, it was not altogether deserted by man. A neighbouring rock-shelter, Mother Grundy's Parlour, which had seasonally housed a similar succession of Upper Palaeolithic visitants, continued to serve as a refuge.

When the New Drift ice withdrew, some of the exponents of the latest Upper Palaeolithic culture roved in the vacated territory. But only the Victoria Cave, Settle,[3] and Kinsey Cave on Giggleswick Scars[4] on the west side of the Pennines provide positive evidence of man beyond the North Midlands during the deglaciation. The relics of the passage of Palaeolithic man and of his farthest northward advance consist of a few implements of Magdalenian type in reindeer antler (e.g. Fig. 2, nos. 3–5).

During an early stage the ice melted in the Atlantic Ocean and receded from its front in Wales, the Irish Sea, and Ireland; and the Scandinavian ice-sheets drew back from the east coast of Britain. With these movements the general deglaciation began, but the process proved long and irregular, for pauses and readvances interrupted the retreat. On our mainland the withdrawal of the New Drift ice freed the north of England, the lower Tweed valley, and even tracts in the north and north-east of Scotland.

Since the general trend of the retreat in Britain was towards the mountains in the north and west, the low grounds sloping towards the North Sea were bared. Therefore, if man advanced northward and penetrated into Scotland at this time, his relics may lie in some sheltered straths and valleys in the North Sea basin, and his trail should be sought in the flatter north eastern English and eastern Scottish country rather than in the hilly west. The possibility that such traces exist has been suggested by flakes found near Comrie, Perthshire,[1] in what may be an interstadial deposit referable to this period.[2] However, these specimens, now preserved in the County Museum, Perth, are not convincing.

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[1] Collins, 1933.

[2] Armstrong, 1939, p. 110.

[3] Breuil, 1922, p. 275; Jackson, 1945.

[4] Jackson, 1945.

For Creswell and a great part of Britain a new age dawned with the oscillation which caused the New Drift ice to recede towards the Scottish Midland Valley. The question of man's cultural development and diffusion in England thenceforward belongs to another chapter. It is sufficient to say here that the Pin Hole Cave and Mother Grundy's Parlour, lying *outside* the end-moraine of the New Drift, are the type-stations of the English Upper Palaeolithic. On the score of its characteristic facies this has been named *Creswellian*.[3] It developed contemporaneously with the Magdalenian of France. To the Creswellian and to elements from the overlying archaeological levels at Mother Grundy's Parlour most of the earliest unambiguous expressions of human culture in Scotland trace their ancestry.[4] They are the products of Mesolithic industries at shore occupation-sites.

9. CORRELATIONS

The sequence from Middle to Upper Palaeolithic at Creswell Crags provides data for the tentative correlation of late Pleistocene events in Britain and on the Continent.

1. In western Europe the Late Palaeolithic cultures developed in like conditions with similar faunas. The place of the Aurignacian is crucial because it is accepted that this culture on the Continent and its equivalent in England are contemporary. On the Continent Aurignacian culture gradually superseded the Mousterian and Late Levalloisian, and throve during the Laufen (W_1/W_2) retreat, or 'Aurignacian oscillation'[5] between the first and second Würm maxima in the Alps. In England it partly coexisted with and replaced the late Middle Palaeolithic during the retreat of the ice-sheets which had been responsible for the Scottish basal till, the Yorkshire Lower Purple Drift, and the Upper Chalky Boulder Clay. It is reasonable, therefore, to correlate (*a*) the first positively recorded glaciation of Scotland and concomitant advances of the ice with Würm I, and (*b*) the succeeding Continental with the British spell of climatic improvement.

Before the second Würm onset, cultures of the Aurignacian complex gave place in some parts of Europe to Proto-Solutrean. This heralded the full Solutrean that flowered locally on the Continent during Würm II. The Proto-Solutrean made a slight impression upon the English Upper Palaeolithic before the peak of the New Drift.

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[1] Breuil, 1937.

[2] Movius, 1942, p. 48.

[3] Garrod, 1926, p. 194.

[4] McCallien and Lacaille, 1941.

[5] Charlesworth, 1929, p. 351.

The Continental Magdalenian and the English Creswellian cultures grew contemporaneously,[1] the former arising during the Achen Recession after Würm II and the latter as the New Drift ice retreated.

2. A consideration of the bonds between British and Fenno-Scandian ice-movements supports the results of these correlations. The westerly drive of the ice-sheets across the North Sea came into contact with streams of the Great Scottish Glaciation. It was concomitant with the Warthe Glaciation, whose front is denoted by the Fläming moraines in Germany and Denmark. It is commonly held that the Warthe Glaciation is the equivalent of Würm I.

The submergence of the fringes of Britain during the retreat preceding the New Drift corresponds to the transgression of the Eem Sea during the melting of the North Sea and the Warthe ice-sheets. Plant and animal remains, and Late Levalloisian and Aurignacian implements from the March-Nar deposits associated with the marine invasion, indicate that the southern parts of Britain and the adjacent Continent at this time enjoyed similar conditions of climatic improvement.[2]

The subsequent Weichsel Glaciation of the Baltic area, regarded as the equivalent of Würm II, had a counterpart in the recrudescence of the North Sea ice-sheets which influenced New Drift flows along the British east coast. The post-Aurignacian age of the New Drift is clear, since deposits referable to this glaciation overlie Aurignacian and Proto-Solutrean relics.

3. The long process of deglaciation opened in the British Isles with the retreat of the New Drift ice and the drawing back of the ice-sheets from our east coast. Around the Baltic it began with the waning of the Weichsel ice, which, receding from its edge marked by the Brandenburg End-Moraine, bared most of northern Germany. Man entered the freed Elbe basin, where he eventually developed the typical Hamburg culture.[3] His earlier migrations must have been comparable with that migration of which

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[1] Armstrong, 1925, pp. 168–74.

[2] Marr, 1919, pp. 222–4; Solomon, 1931; Baden-Powell, 1934, p. 216.

[3] Rust, 1937.

TABLE I

The Northward March of Palaeolithic Man in Britain and its relation to the Principal Events of the Pleistocene in Europe

DATES B.C. (*approx.*)	SCOTLAND	IRELAND	ENGLAND	NORTH GERMANY	ALPS	CULTURES
	SCOTTISH READVANCE	Irish Readvance	Local advances of glaciers in the north only	Baltic End-Moraine (Pomeranian Stage)	Würm III (Bühl)	Upper Palaeolithic
	Cumberland—Isle of Man—North-east Ireland End-Moraine					
– 18,000	*RETREAT OF THE NEW DRIFT ICE*					
	Withdrawal of the ice to Midland Valley and from some areas in the east and north-east *Withdrawal of the Scandinavian ice from the East Coast*	*Withdrawal of the Scottish ice* *Withdrawal of Irish ice to Central Plain*	*Withdrawal of the ice-sheets from England* *Withdrawal of the Scandinavian ice from the East Coast; Man at Settle, W. Yorks.*	*Daniglacial Period*	*Achen Recession* (W_2/W_3)	
	NEW DRIFT COMPLEX					
	STRATHMORE ICE-SHEET (Red and Upper Boulder Clays)	Southern Irish End-Moraine	Hessle-Hunstanton Boulder Clay, and associated boulder clays of North Wales, Lincs., etc.	Weichsel (Brandenburg Stage)	Würm II	
	RETREAT PERIOD WITH CLIMATIC IMPROVEMENT					Middle Palaeolithic
	Mammoth, Rhinoceros, and Reindeer	*Mammoth and Reindeer*	*March-Nar Submergence*	*Eem Submergence*	*Laufen Retreat* (W_1/W_2, '*Aurignacian oscillation*')	
	Temperate flora locally	*Temperate flora locally*	*Man in Yorks. north of Humber*			
	THE GREAT GLACIATION		Upper Chalky Boulder Clay	Warthe (Fläming Stage)	Würm I	
	Till or Basal Grey Boulder Clay	Indurated Boulder Clay	Yorkshire Lower Purple Drift, and associated deposits			
			Hoxne Brickearth		*Riss-Würm Interglacial*	Lower Palaeolithic
	?	?	Middle Chalky Boulder Clay	Saale	Riss	
			'100-ft.' Terrace Gravels of the Thames (Swanscombe) *Man near Bridlington, E. Yorks.*		*Mindel-Riss Interglacial*	
	Ice which contributed rock of Ailsa Craig type to Thames Valley?	?	North Sea Drift and Lower Chalky Boulder Clay	Elster	Mindel	
			Cromer Forest Bed		*Günz-Mindel Interglacial*	
	?	?	Red and Weybourne Crag; 'Oldest Drifts' of Chilterns?		Günz	

the late Upper Palaeolithic relics at Settle are evidence. Because this phase also witnessed the liberation of Denmark, it is called the Daniglacial Period. It is equated with the Achen Recession of the Alpine glaciers.

4. If these correlations are valid, then the earlier major episodes bearing on Palaeolithic man in Britain fall into place as shown in the accompanying table (Table I, p. 28).[1] This broad scheme includes the subsequent re-advance of the Scottish ice which corresponds to the third Würm (Bühl) phase of glacial activity in the Alps. The Würm Glaciation of Alpine chronology is, therefore, the background of prehistoric Scotland.[2]

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[1] Boswell, 1936, pp. 159–60; Zeuner, 1937; Paterson, 1940, pp. 406–10.

[2] The reader may have in mind the possibility of Scottish caves as Palaeolithic stations. He will remember the suggestion that the charcoal, horn implements, and marks on reindeer antlers from the lower strata of a cave at Inchnadamph, Sutherland, are attributable to late Upper Palaeolithic man (Callander, Cree, and Ritchie, 1927, p. 171). These relics have been considered to antedate the last extension of the Highland ice, namely, the District, Valley, or Moraine Glaciation (Movius, 1942, pp. 72–74). This event is much later than any mentioned above, and it will be considered in the next chapter. In that case the retreat of the ice in the penultimate stage of the deglaciation must have been more extensive and the conditions more congenial than was formerly thought. To the writer, however, the animal bones appear to represent a late arctic fauna which survived in a refuge area into Early Post-Glacial times (below, pp. 82, 88, 90). In archaeological terms they could not therefore be earlier than Mesolithic, or even Neolithic in age, as was believed of similar remains from an adjacent cave (B. N. Peach and Horne, 1917, p. 343). Whatever the interpretation, traces of man's progress towards north-west Sutherland should be sought and assigned to their true horizon. Because of the geological, palaeontological, and archaeological implications of the Inchnadamph caves, a further report is eagerly awaited.

II

THE DEGLACIATION OF SCOTLAND SETS THE SCENE FOR MAN'S ENTRY

1. THE MELTING OF THE NEW DRIFT ICE

SCOTLAND was opened to human settlement by the melting of the New Drift ice. The retreat continued, therefore, beyond the bounds of any known interglacial period. But just as the Pleistocene glaciation of the British Isles had been irregular, so was the deglaciation. Pauses and even powerful readvances broke up the recession into periods of retreat before the third and final melting, and changes took place in the relations between the land and sea. Thus the process resembled earlier passages from cold to congenial conditions.

The First Period of Retreat marked the beginning of the Late-Glacial history of Scotland which formed part of that of the general liberation of the ice-shrouded regions of Europe. It witnessed the recession of the Scandinavian ice-sheets from their off-shore position along the east coast of Britain. Elsewhere, on land and in the sea, the ice wasted back from the whole line of the New Drift (map, Fig. 9 *a*), in Britain into the mountains of Wales and to the borders of the Scottish Midland Valley, in Ireland into the central, western, and southern hills. The Shetlands, much of the Orkneys and Hebrides, stretches of the Scottish east coast, the lower Tweed valley, and most of the territory south of it were freed.

From now, the movements of the Scottish ice are our main consideration. As regards the British Isles, the withdrawal in Ireland had much in common with that in Scotland and is better known. As yet the sequence for Wales has not been fully established. This country of high mountains and the English Lake District may have been affected by the major oscillations which operated upon the Irish ice-centres lying in the same latitudes.

A requickening of the ice in the higher parts of the Orkneys and Hebrides, in the Highlands, and Southern Uplands initiated the movements known as the Scottish Readvance, and brought the First Period of Retreat to a close. The Highland contribution predominated and flowed mainly west to east. At its peak it filled the Moray Firth and, unaffected this time by off-shore currents, stretched to an unknown line in the sea east of Buchan and returned to the mainland in Berwickshire. It merged in central Scotland with Southern Uplands ice-sheets, while confluent moving glaciers covered the western seaboard. Among these the great Firth of Clyde stream was so reinvigorated that its main flow came ashore in Down, Antrim, and Donegal, and thence pushed north-westward into the Atlantic Ocean. It did not, however, come into contact with the Irish ice which waxed independently.[1] A branch swept through the North Channel, coalesced with ice fed in the Southern Uplands, and swung across the Irish Sea. On land the great North-east Ireland–Isle of Man–Cumberland Moraine registers the limits of the readvance. East of Carlisle these are uncertain, but moraines north and south of the lower Tweed may be referable to this complex.[2]

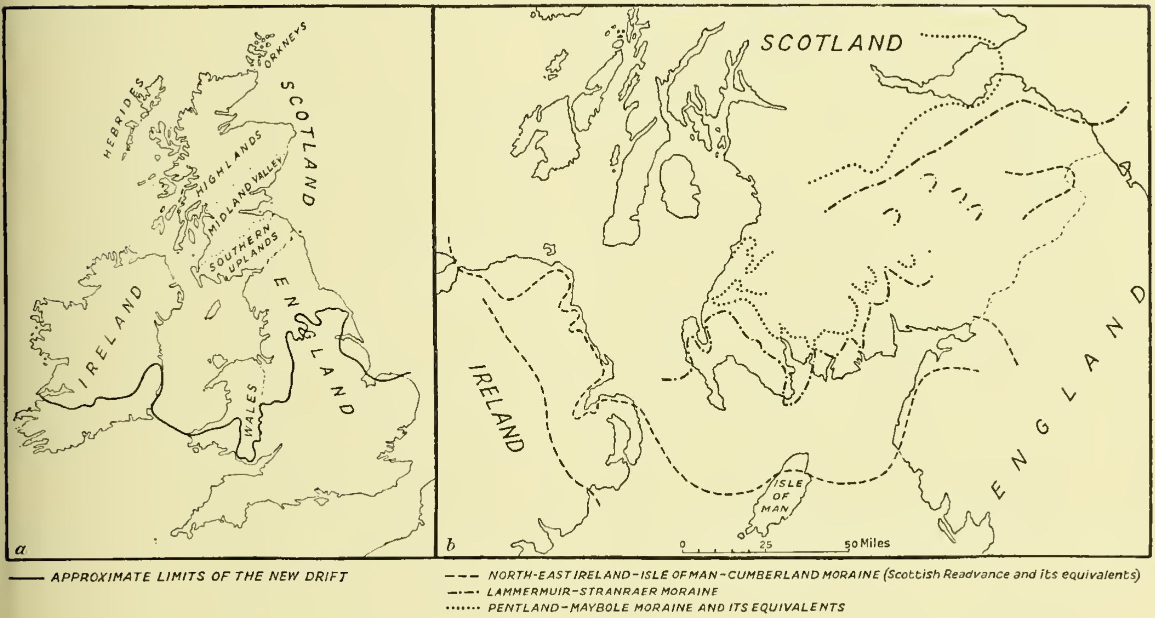
HEBRIDES
ORKNEYS
SCOTLAND
HIGHLANDS
MIDLAND VALLEY
SOUTHERN UPLANDS
IRELAND
ENGLAND
WALES
a
SCOTLAND
IRELAND
ISLE OF MAN
ENGLAND
0 25 50 Miles
b
—— APPROXIMATE LIMITS OF THE NEW DRIFT
--- NORTH-EAST IRELAND-ISLE OF MAN-CUMBERLAND MORAINE (Scottish Readvance and its equivalents)
-·-· LAMMERMUIR-STRANRAER MORAINE
······ PENTLAND-MAYBOLE MORAINE AND ITS EQUIVALENTS

FIG. 9.

a. Map showing the approximate limits of the New Drift Glaciation of the British Isles.

b. Map showing the approximate limits of the Scottish Readvance and stages in the subsequent retreat of the ice in southern and central Scotland. (Based on Charlesworth, 1926 (*b*).)

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[1] Among the most important Irish movements of the time was the Carlingford Readvance (Charlesworth, 1943, p. 89).

[2] Charlesworth, 1926 (*b*), p. 49.

During the Second Period of Retreat the Scottish ice withdrew from the far-flung limits of the readvance. It left the north of England for good, thinned back towards the centres of accumulation, shrank from the shores of Northern Ireland, and melted out into the coastal area. All but the highest grounds in the Orkneys and Hebrides were deglaciated, and meanwhile sea-level was rising round Scotland.

Renewed glacial intensity and oscillations along the ice-fronts interrupted the Second Period of Retreat, initiating movements which involved the mainland almost as extensively as the Scottish Readvance. Confluent Highland glaciers again filled the Midland Valley. Local ice, fed in the hills of Fife and the neighbourhood, was stirred into activity, but this time it did not join the Highland streams. The Southern Uplands once more supported an ice-sheet and their glaciers flowed north and south down the main valleys, in the upper reaches of the Tweed and its Cheviot tributaries. The ice extended into the Solway, bulged over Carrick and the Rhinns, fanned out into the sea, and just broached the coast of Antrim.[1] That it could spread so far is explained by the southerly extent of the western mountains where the greatest precipitation lay in Late-Glacial times.[2] On land the Lammermuir–Stranraer Moraine denotes the edge of the ice at the peak of these readvances. The absence of this moraine between eastern Ayrshire and the south-western coast (see map, Fig. 9*b*) indicates that even at this time the Highland ice was confluent with glaciers nourished in the western Southern Uplands.[3]

The various movements were probably contemporaneous but their maxima were not. Among them, the Perth Readvance, which involved the valley of the Teith, Strathallan, and Strathearn, was a constituent of the concomitant and long-persisting District, Valley, or Moraine Glaciation. It has to be singled out for its association with the marine invasion of the lower reaches of the Tay.[4] In the east of Scotland, however, the readvancing ice did not everywhere gain the sea. It was otherwise in the north-west and west, where the snowfall, like the present rainfall, was greatest, the glaciers were largest, and came down to the lowest level. Especially noteworthy are the deposits which make plain the connexion of these Highland ice-streams with the sea of the time.

With the subsequent withdrawal of the ice from the line of the Lammermuir–Stranraer Moraine, Scotland entered into the Third Period of Retreat, or last and protracted phase of deglaciation. Gradually the ice melted out of the North Channel, coastal seas, and Midland Valley. The Southern Uplands, the Lammermuir and Pentland Hills were cleared by stages, one being well marked by the Pentland–Maybole Moraine and its equivalents. Their ice-sheet was reduced to corrie glaciers, and the whole valley of the Tweed was laid open. North of the Firth of Forth the lesser ranges of hills were bared. Finally, the Highland ice split into two great glaciers occupying the valleys of the Clyde and Forth. It then receded stepwise up the glens towards the snowfields.

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[1] McCallien, 1937 (*a*), pp. 186, 191.

[2] Charlesworth, 1926 (*a*), p. 47.

[3] Ibid., p. 50.

[4] Simpson, 1933, pp. 633–41.

The sequence is difficult to establish, particularly along the Highland border where the ice nourished in the great mountain masses loosened its hold slowly. Not only so, but on many islands and on the mainland in the west ice lay long over areas down to 1,250 feet above sea-level, and sent forth active glaciers. Indeed, it has been claimed that the snow-fields gave birth later to small glaciers whose moraines indicate a snow-line at 2,500 feet, and again at about 3,500 feet.[1] In the present state of knowledge only for southern and central Scotland can a map be shown of the principal stages of retreat from the limits of the Scottish Readvance (Fig. 9 *b*).

2. RELICS OF THE DEGLACIATION

During the first period of withdrawal from the limits of the New Drift, sands, gravels, and lacustrine sediments were laid down in the English north country. Plant remains in peat, between these deposits and the boulder clay of the Scottish Readvance, indicate that the retreat endured long enough for a cool temperate flora to grow in the low grounds at least as far as Cumberland.[2] In south-east Yorkshire the equivalent plant-containing peat overlying New Drift deposits is capped by arctic beds which are due to the influence of the Scottish Readvance.[3] By comparison, those parts of the Scottish mainland that were deglaciated during the First Period of Retreat were certainly inclement, if only because of their proximity to the gathering-grounds of the ice.

During the later stages of the retreat of the ice from the glaciated areas of the British Isles the climate moderated in those parts of England which had been freed earlier. Of course, there were set-backs as a result of the interruptions which broke the continuity of the recession in the mountainous areas.

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[1] J. Geikie, 1894, pp. 252–4.

[2] Eastwood, Dixon, Hollingsworth, and Smith, 1931, pp. 244–5.

[3] Harrison, 1937, p. 239.

As the retreat was resumed after the Scottish Readvance, the conditions in Scotland reproduced on a much greater scale those which attended the early phases of the thaw in the less heavily shrouded regions. The Second Period of Retreat, during which the Midland Valley was freed, was marked by the impounding of heavily charged melt-waters between the flanks of the hills and dead ice in lowland areas. The streams which poured from the glacial lakes so formed, often after bursting through the dams of packed ice and heaped sediments, carved through hindering deposits. Dry valleys, well-defined marginal channels, and terraces at successively lower levels, corresponding to stages in the retreat, mark the tracks and show the erosive power of the torrents.[1] Among the sands and gravels laid down in the glacial lakes, those near Cadder, Dunbartonshire, are famous for having yielded a bone of rhinoceros.[2] It was derived from an earlier deposit, as was the molar tooth of a mammoth found in similar conditions in the lower Carron valley.[3] The most conspicuous features which mark the wake of the icy gravel-laden waters are the tarn-dimpled kames and the eskers across the south side of the Midland Valley. Conditions in the theatre of these movements must have been forbidding in the extreme. They would magnify to an immeasurable degree what takes place in our time during a protracted thaw after a hard winter of long-lying snow and fast frost.

Evidence of late and protracted deglaciation abounds in the hills, moors, and valleys of the Southern Uplands where small moraines mark the trail of the ice. Greater significance, however, attaches to the visible legacies of the last ice-sheets and glaciers in the Highlands. There is hardly a valley but contains boulder clay and fresh-looking morainic cones and ridges attributable to the last movements of the ice. The relics show how recently most of Scotland passed from arctic severities, and make it plain that animals and man could have penetrated only late into these regions. Indeed, during winter it is not difficult for the imagination to recapture the inhospitable conditions which reigned as the ice dwindled. The marks that the ice has left in the Highlands are profuse and only a few can be mentioned here.

[1] M. Macgregor, and A. MacGregor, 1936, p. 84.

[2] Swinton, 1927; and above, p. 22.

[3] Absalom and Henderson, 1945; and above, p. 22.

The many traces of great glacial lakes formed in the Highland valleys by the penning of the melt-waters by barriers of glacier-ice or moraines are impressive. The most spectacular are the celebrated Parallel Roads in Glen Roy and adjacent glens in Lochaber, representing the successive strand-lines of a vast ice-dammed lake.[1] Unsilted moraine-dammed basins high up in the hills, exposed when the glaciers retired, also bear witness to the late disappearance of the ice. In a way they reproduce in miniature the fjords and lochs at lower altitudes, the floors of which were gouged out by moving ice charged with abrasive ingredients.

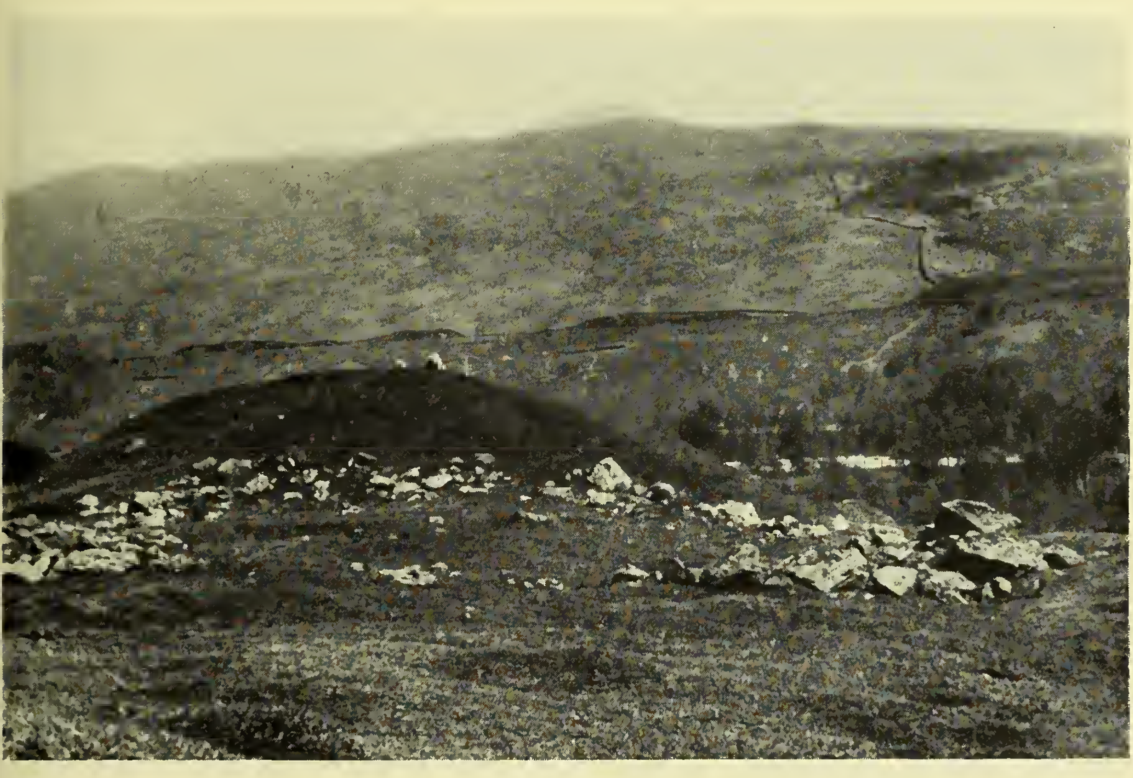

FIG. 10. Circle of stones left in the trail of the ice, Strathfillan, Perthshire.

Other records of the deglaciation appear in countless moorland lochans. Peat and other vegetable deposits now fill, or are in the process of filling, many of these pools, just as they did the earlier ponds outside the boundaries of the Highlands, especially between Forth and Clyde. Such peat-filled tarns are particularly numerous in the high grounds east of Glasgow, where there survive a few open lochs of glacial origin.

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[1] A. Geikie, 1901, pp. 287–94.

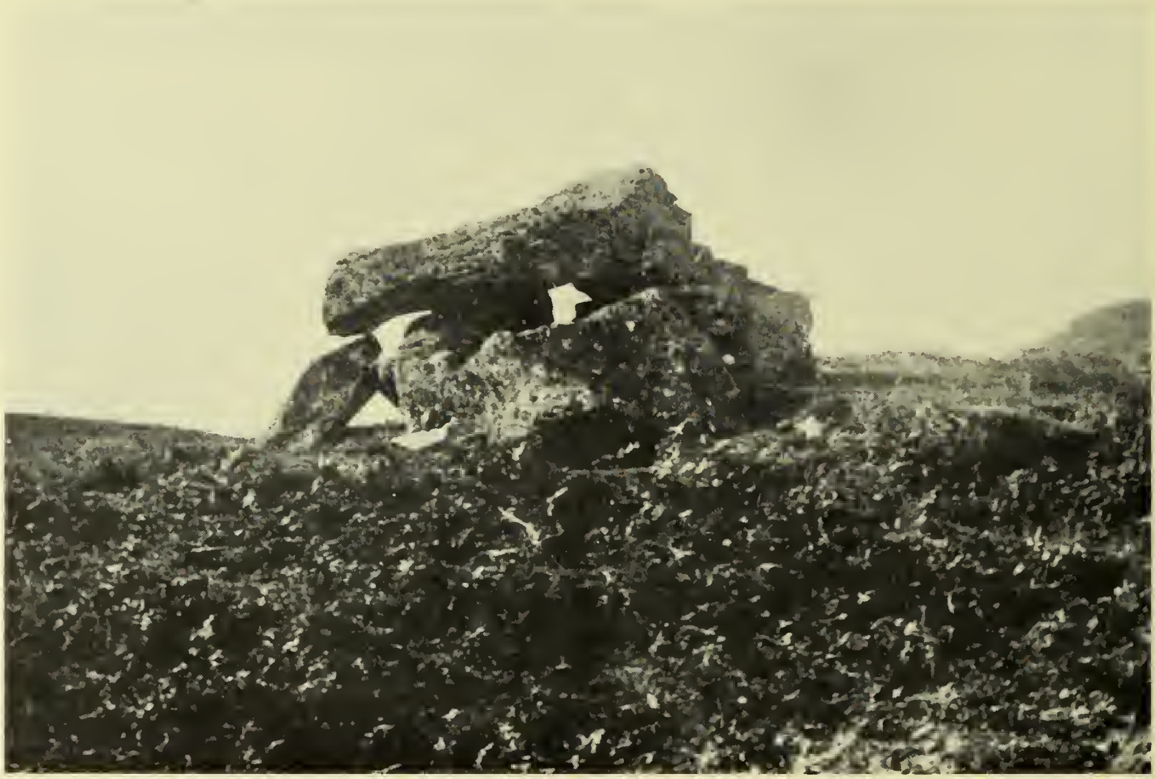

Fig. 11. Piled, ice-shattered boulders resembling a dolmen, Strathfillan, Perthshire. (Photograph by G. Place, Crianlarich.)

The amazing number of small lakes left in the trail of the ice in the Orkneys, Shetlands, and Hebrides, and on the mainland particularly in western Ross and Sutherland, has its parallel in the areas vacated during the last stages of the retreat in Ireland, Scandinavia, and Finland.[1] It is with good reason, therefore, that the term 'lake-bearing' has been used in connexion with the Youngest Drift areas in recent references to the last movements of the ice on both sides of the North Sea.[2]

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[1] A. Geikie, 1901, pp. 250–3.

[2] Wright, 1939, p. 29.

Perched blocks, *roches moutonnées*, angular and shattered boulders occurring isolated or in groups, besides diminishing moraines at intervals as far back as the edges of the old snow-fields, are striking marks of the decline of the glaciers. Many of these memorials are wreathed with legends, and have been objects of speculation on the part of uncritical amateurs. For, as scarred and fractured stones collected in glacial and other deposits have been regarded by enthusiasts as palaeoliths (Chapter I, pp. 10–11), so the unwary have claimed that they have recognized man's work in sundry relics of the final melting. Thus, boulders, freakishly strewn and heaped in the wake of the ice, have been taken for prehistoric stone-settings (Fig. 10) or monuments (Fig. 11). Some have supposed that the ice-planed and weathered rocks showed prepared surfaces with sculpturings, and moraines

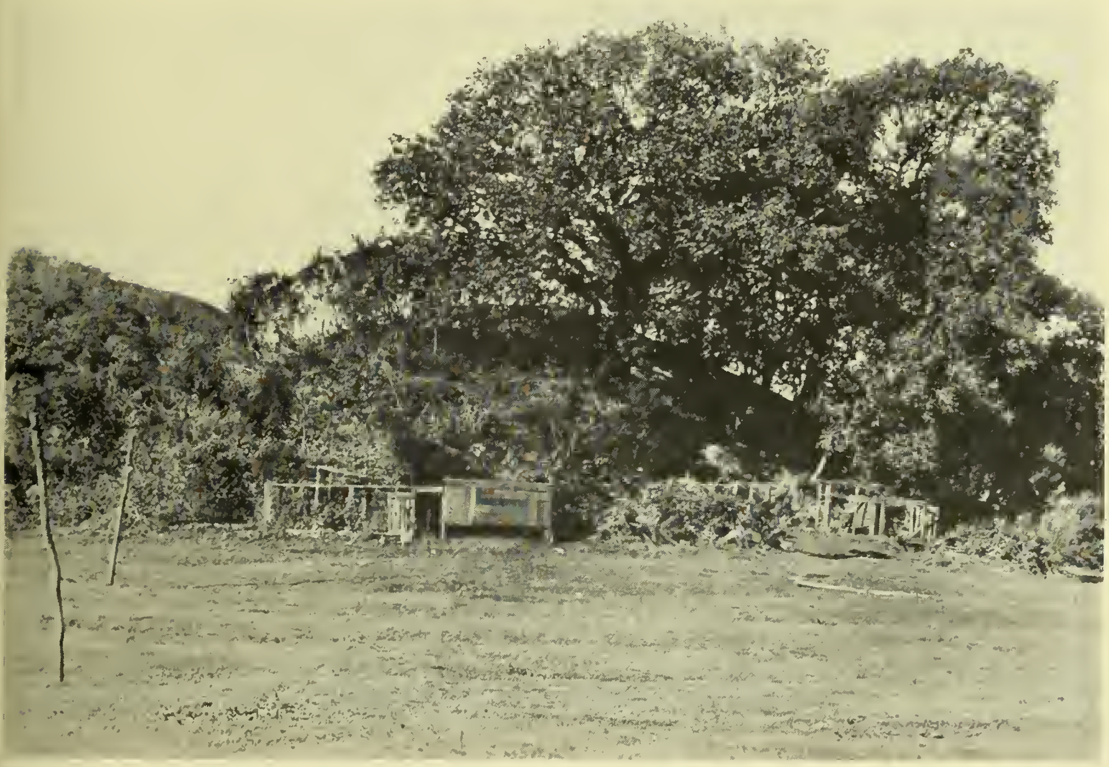

FIG. 12. A morainic mound, resembling a Bronze Age round cairn, Inverbeg, Loch Lomondside, Dunbartonshire.

have been mistaken for burial cairns (Fig. 12).[1] It is true, of course, that some of these features attracted early settlers in once glaciated regions. For upon many ice-borne boulders and ice-smoothed living-rock surfaces man in a stage of Bronze Age culture cut those cup-and-ring markings which today are among the enigmas of prehistory.

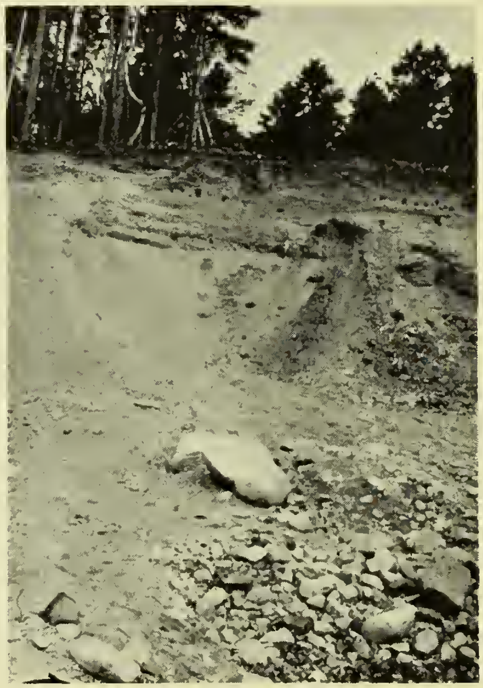

FIG. 13. Fluvio-glacial gravels at Crathes, Deeside, Aberdeenshire.

Other evidences of the last stages of deglaciation are found in Highland valleys. They are particularly clear in the North Sea basin, where the channels, which carried down the melt-waters, are relatively large and filled with gravels (Fig. 13) laid down during earlier periods of retreat. Since the coastal grounds had been rising as the remnant ice melted, the swollen and heavily charged rivers sought their base-level. In so doing

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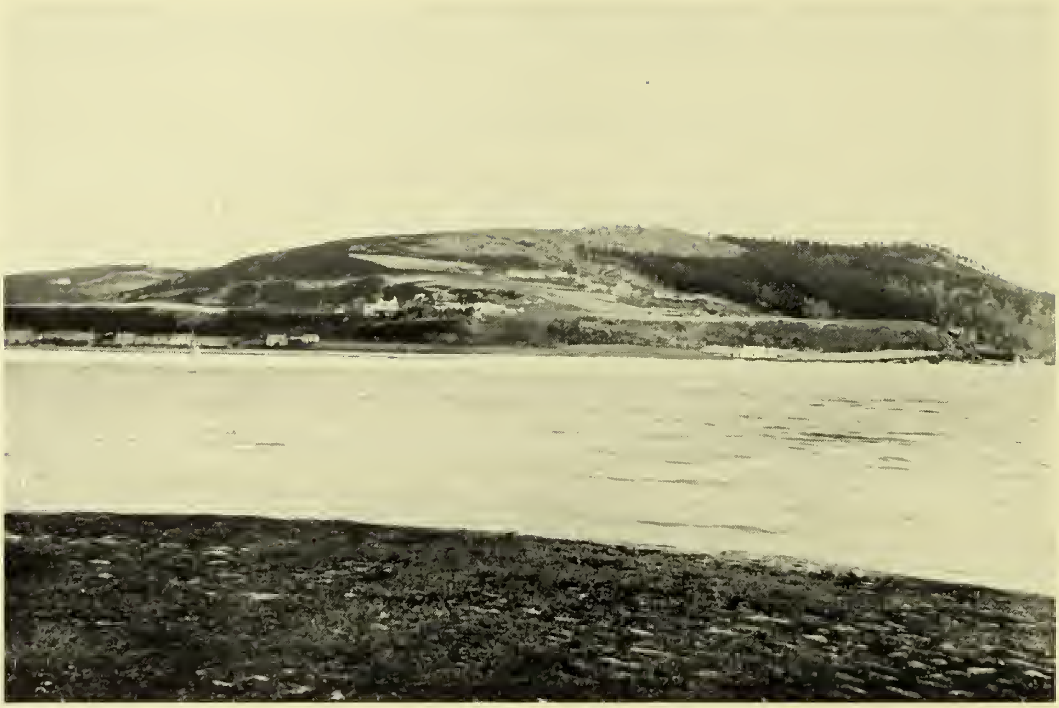
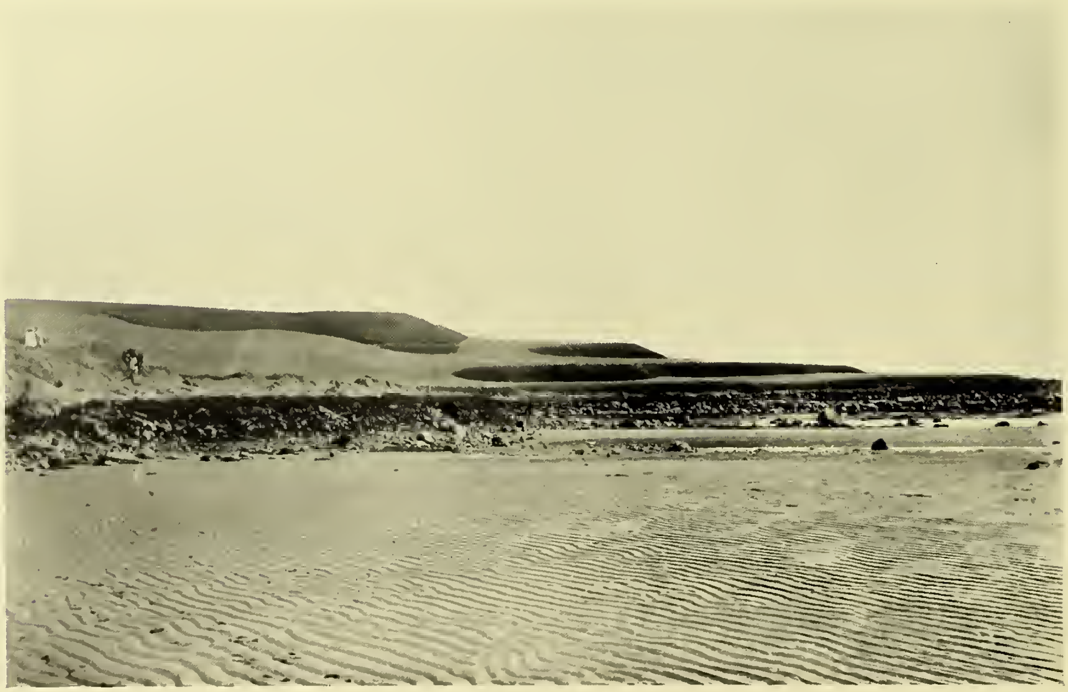
[1] A mound of glacial origin which has received attention is known to the writer, namely, a long sinuous ridge on the lower slope of the hill-side at Milton in the Endrick valley in the parish of Buchanan, Stirlingshire (lat. N. 56° 5′ 15″, long. W. 4° 28′ 30″). It is described as a fort on the Ordnance Survey six-inch and one-inch maps. Actually it is a relic of the Loch Lomond Re-advance (pp. 42–43 below, and Simpson, 1933, pp. 651–5).



(*a*) RAISED BEACHES AT NORTH KESSOCK, OPPOSITE INVERNESS

The higher is the '100-foot' formation, and is attributed to the Late-Glacial sea; the lower, the so-called 25-foot beach, records the transgression of the Early Post-Glacial sea.

(*From a photograph by R. Lunn.*)



(*b*) RAISED BEACHES, ELIE, FIFE

The lowest is the Early Post-Glacial formation; the higher beaches record stages of the Late-Glacial sea.

(*From a photograph by A. G. Stenhouse.*)

Plates I (*a*) *and* (*b*) *from photographs supplied by the Director of the Geological Survey and Museum by permission of H.M. Stationery Office. Crown Copyright.*

they carved out deep gorges locally, and ploughed through old deposits, re-sorting and spreading them downstream. In the flatter reaches nearer the sea they formed alluvial terraces at successively lower levels. Save for later minor changes most of the Scottish rivers then assumed the courses which they follow at the present day.

3. THE LATE-GLACIAL SEA OF SCOTLAND

By the time the Second Period of Retreat was well under way the fringes of Scotland lay under the sea. A similar but far greater marine transgression took place around the Fenno-Scandian centre as the ice contracted. This raising of sea-level was, of course, due to the release of the waters locked up in the ice. What volumes were freed may be imagined when it is remembered that on a conservative estimate the ice-sheets of the Northern Hemisphere covered some 490,000 square miles and averaged 3,000 feet in thickness—enough, indeed, by their melting to raise the level of the sea more than 200 feet all over the world.[1] The Scottish contribution was small compared with that provided by the dissolution of the ice in the northern Baltic area.

While the absolute rise of the sea-level was the same everywhere, i.e. eustatic, the recovery of the land which followed was isostatic and most pronounced where the load of ice had been heaviest. There the uplift eventually overcame the sea-rise and produced the raised beaches which are prominent in Scotland and the Baltic area.

The maximum transgression of the Late-Glacial sea is registered in Scotland by the so-called 100-foot raised beach, that locally conspicuous feature of the coasts, principally around the Highlands (Pl. I *a*). Here and there only a notch or platform records the encroachment of the cold sea. Actually, the highest strand-line does not occur uniformly at 100 feet above present sea-level. The beach is absent from the Orkneys, the Outer Hebrides, and the extreme north of the Scottish mainland. In Ireland its equivalent is present only in the north where it stands about 50 feet above O.D., as it does in Wigtownshire and Berwickshire in Scotland. It occurs at approximately the same elevation in Sutherland. Its zero-isobase would therefore lie beyond these northerly and southerly limits.[2] Inside, the elevation of the beach progressively rises to more than 100 feet (map, Fig. 14). The maximum at 155 feet near Doune in the Forth basin[3] indicates

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[1] Antevs, 1928, p. 81.

[2] Wright, 1937, p. 369.

[3] Dinham, 1927, p. 488.

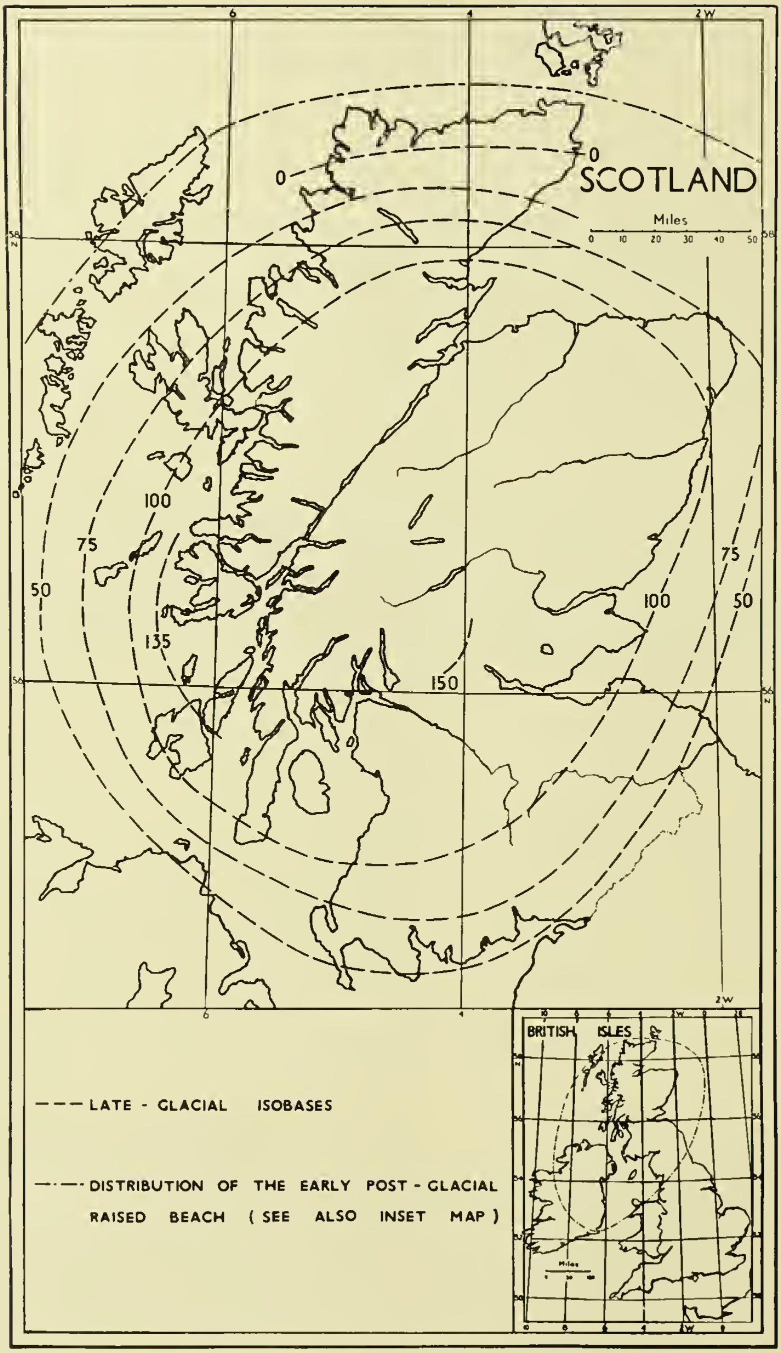
SCOTLAND
Miles
0 10 20 30 40 50
6
4
2W
58 N
56 N
0
0
50
75
100
135
150
100
75
50
— — — LATE - GLACIAL ISOBASES
—·—· DISTRIBUTION OF THE EARLY POST - GLACIAL RAISED BEACH (SEE ALSO INSET MAP)
BRITISH ISLES
Miles

Fig. 14. Map showing Late-Glacial and Early Post-Glacial isobases in Scotland. (Based on Wright, 1937, and Movius, 1942.)

that the greatest subsequent recoil took place in the Highlands near the main Late-Glacial centre of dispersal.[1]

The invasion of the Scottish coasts by the Late-Glacial sea converted peninsulas into islands and flooded land-troughs, changed great lochs into fjords, and so distended the estuaries in central Scotland that the Highlands were almost separated from the land in the south (map, Fig. 15).

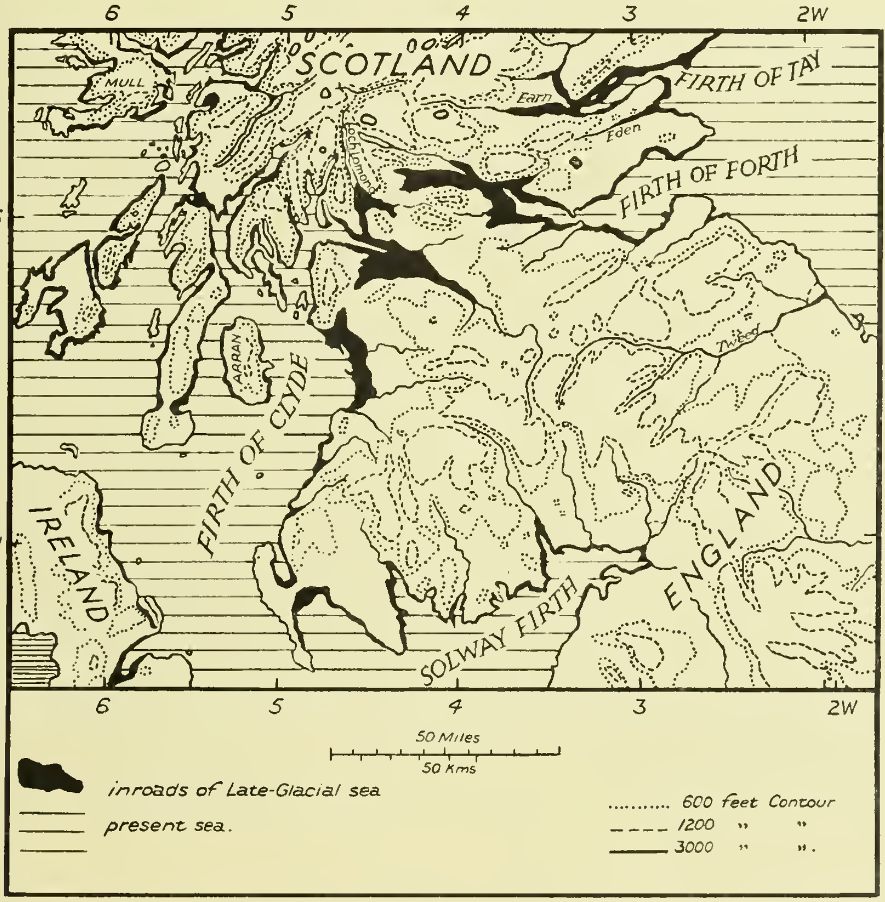

FIG. 15. Map showing the encroachments of the Late-Glacial sea in southern and central Scotland.

From the time of the last phase of the retreat the question of the relationship between land and sea becomes increasingly important. It concerns changes in the outlines and climate of Scotland, the growth of plants, the immigration of animals, and the peopling of the country by a few scattered communities.

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[1] Movius, 1942, p. 59.

Recent research has shown the connexion between the ice and the Late-Glacial sea on the borders of the Highlands and the Midland Valley during the last glacial episodes and the final retreat of the ice. Laminated clays between the surface-moraine and a lower boulder clay indicate that the sea had invaded the lower Tay and Earn valleys before the Perth Readvance (p. 32, above), and that the land had risen at least 40 feet after the retreat of the ice.

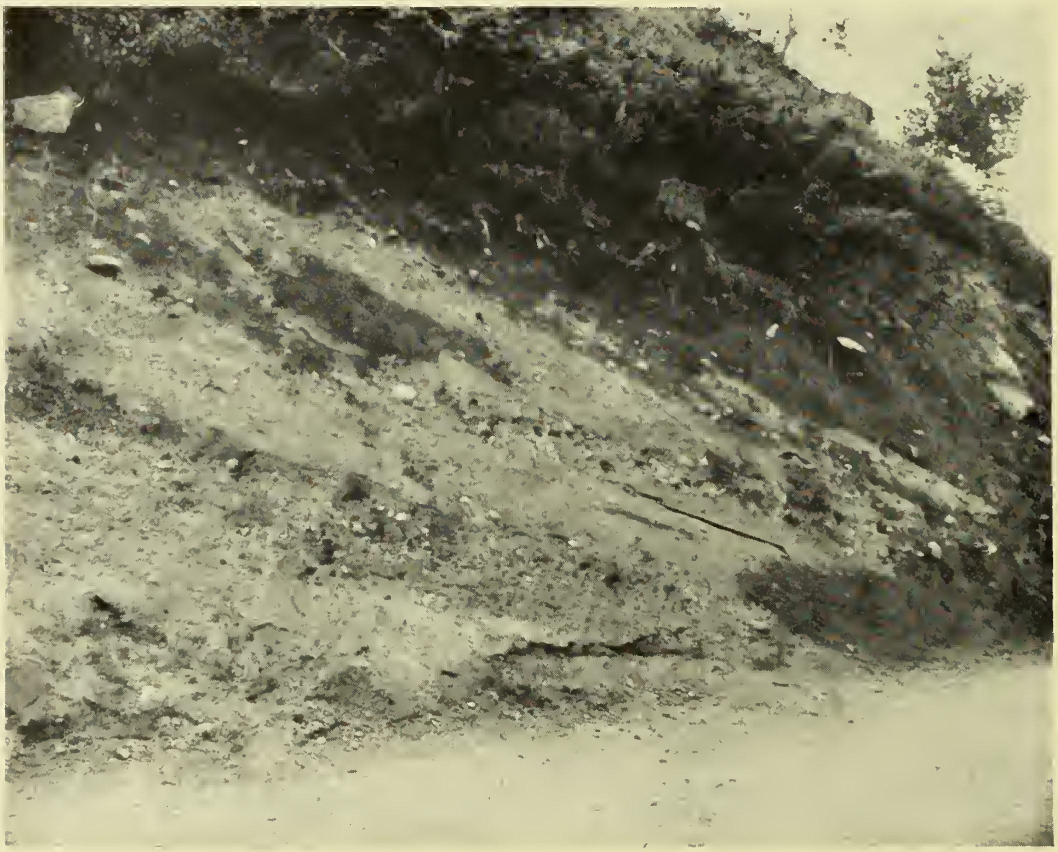

FIG. 16. Boulder clay containing arctic marine shells at Balmaha, Loch Lomondside, Stirlingshire.

Deposits of the later contemporaneous readvances of the Loch Lomond and upper Forth glaciers afford similar evidence. During the interstadial period preceding these companion movements Loch Lomond and the upper Forth were arms of the sea tenanted by a varied arctic fauna. This is particularly represented in boulder clay in the southern part of the Loch Lomond basin (Fig. 16). Before these readvances of the ice the submergence in both areas was at least 65 feet, and after the beginning of the retreat not more than 50 feet.[1]

South-west of these localities the readvance of a glacier down the Gareloch is proved by the Rhu moraines which are charged with marine arctic deposits. This shows that the high-level cold sea had access to that inlet at the same time as it occupied the Loch Lomond depression.[2] A few miles away moraines descending to within 40 feet of present sea-level record the connexion between the Glen Messan (Massan, O.S.) glacier and the enlarged Holy Loch of Late-Glacial times.[3]

From the above it may be inferred that the Late-Glacial sea transgressed the coast when the ice retreated inland. In the north-west and west (Fig. 17 *a*), however, the long-enduring ice barred it out of many inlets. This is shown by the absence of the so-called 100-foot beach in the inner reaches of some lochs and its presence in the outer parts.[4]

Whether the peak of the last and local glaciation coincided with, or was later than, the maximum transgression of the Late-Glacial sea has yet to be determined. It is abundantly clear, however, that glaciers continued to flow into the arctic sea *after* the land had emerged considerably. A few instances may be cited.

From the eastern side of Mull to Skye and Lochs Torridon and Alsh the coasts of the islands and adjacent mainland abound in outwash fans spread across raised beaches below the '100-foot' strand-line. Piedmont glaciers in Mull kept out the sea locally and cut into stretches of a beach at 75 feet.[5] Glacial deposits there also came down to about 30 feet (Fig. 17 *b*). Below this they were re-sorted or overlaid during the later Post-Glacial marine invasions (below, pp. 53–57). A similar story is told by ice-borne detritus resting upon a beach at 30 feet at the mouth of Glen Iorsa, Arran.[6]

The beaches and notches below that which registers the maximum

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[1] Simpson, 1933, p. 645.

[2] McCallien, 1937 (*b*).

[3] Maclaren, 1850.

[4] Wright, 1937, pp. 371–2.

[5] McCallien, 1937 (*a*), pp. 189–90.

[6] Chambers, 1854.

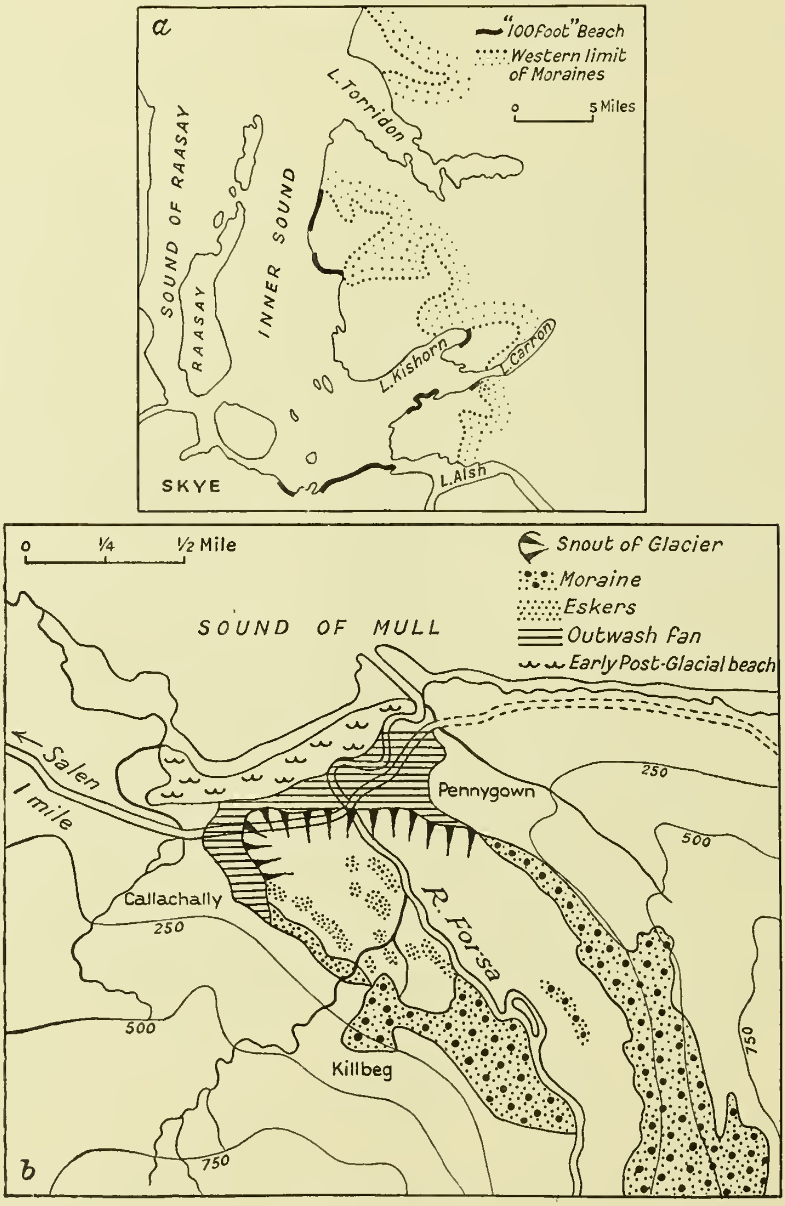

FIG. 17. *a*. Map showing the relation of the western limits of the moraines of the District, Valley, or Moraine Glaciation to the beach recording the maximum of the Late-Glacial sea on the mainland of Scotland east of Skye. (Redrawn from Wright, 1937.)

b. Map showing the deposits of the Valley Glacier in the lower part of Glen Forsa, Mull, and their relation to the Early Post-Glacial raised beach. (Based on Fig. 66, Mull Memoir, *Geol. Surv. Scot.*, p. 404.)

submergence are evidence that the process of land recovery was neither steady nor uniform. Around the main ice-centre the most prominent stand about 75 and 50 feet above present sea-level. These records of the Late-Glacial sea, however, may not be of the same age everywhere. For instance, before the events in the west (Pl. I *b*), sea-level had fallen to about 75 and 50 feet respectively near Dunbar, East Lothian, and St. Abb's Head, Berwickshire.[1] The discrepancy is explained as a consequence of the lightening of a load which was less considerable in that part of the country than in the other.

4. THE RETREAT OF THE ICE IN THE BALTIC REGION

The eustatic and isostatic movements around Scotland were bound up, though not necessarily synchronous, with those which attended the waning of the Fenno-Scandian ice. In Scotland the process of land recovery must have begun and developed earlier than in Scandinavia owing to the smaller burden Scotland had to throw off. Equilibrium between land and sea must also have been established around our shores earlier than in Scandinavia and before the maximum of the Yoldia Sea (pp. 48–50, 58 below). As this water-body of the Baltic area is held to have been the late counterpart of the high-level cold sea outside,[2] we must consider how it came into existence and what events followed its formation. This is necessary for correlation and for an understanding of our archaeological background, which owes much to the Baltic countries.

As the New Drift glaciation of the British Isles was largely concomitant with the last great extension of the Scandinavian ice-sheets, so the actual movements and stages of the deglaciation had their equivalents on both sides of the North Sea. They were related at first, but independent later, though due in all likelihood to the same ruling causes.

During the First Period, the Daniglacial or German Substage, the ice nurtured in northern Europe withdrew from the east coast of Britain, retreated from the Brandenburg End-Moraine, and uncovered north Germany and most of Denmark. It then halted at the line of the Baltic End-Moraine. The Second Period, the Götiglacial, comprising the Danish and Scanian Substages, freed southern Sweden, Götland, and part of Finland, and closed with the formation of the Fenno-Scandian End-Moraines. During the

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[1] McCallien, 1937 (*a*), p. 190.

[2] Idem, 1935, p. 71.

Third Period, the Finiglacial or Bothnian Substage, the ice vacated Finland and the greater part of Sweden. After pausing and laying down moraines in Jämtland it split into two lobes at Ragunda (see Fig. 19 *b*). This bipartition of the ice is held to mark the beginning of Post-Glacial time in northern Europe. Since then, the remnant ice has continued to melt.

5. GEOCHRONOLOGY

(*a*) *Varved clays in the Baltic Region.* Varved or banded clays (Fig. 18) provide a means of calculating Late-Glacial and Post-Glacial time. They consist of sediments laid down in lakes by the melt-waters as the ice retreated. Since the thaw was more rapid in summer, heavier particles were deposited during that season than in winter. Hence a complete layer or varve showing alternations of coarse and fine materials represents one year. Varves, however, differ in thickness from 2 mm. to 3 cm., because deposition was greater in a warm than in a cold year.

As the ice retreated and freed new ground, so each fresh varve was laid down on the ends of those which were older. Thus, except where moraines denote pauses in the withdrawal, the varved deposits appear today to overlap each other like slates on a roof. Varves in one locality have been found to match those in another. Correlations have thus been made possible, and gaps in the order bridged by finding a corresponding section. By piecing together the varve record in the Baltic region a veritable calendar has been established for the various changes which attended the deglaciation.[1] The significance of this geochronological scale, therefore, cannot be overrated.

As yet there are no varve measurements for the first, or Daniglacial, period of retreat. Taking into account a different method of computing a time-scale for earlier events, we may assign to about 18,000 B.C. the close of the Daniglacial Period with the Pomeranian Stage, marked by the Baltic End-Moraine. It is estimated that the retreating ice was arrested along this line for 3200 years.

A count of the varves in the area progressively vacated by the Fenno-Scandian ice suggests that the second, Götiglacial, period of retreat began about 14,800 B.C. and ended about 8300 B.C. The pause denoted by the Fenno-Scandian Moraines is thought to have lasted some 500 years, so that the third, Finiglacial, period of retreat would open about 7800 B.C.

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[1] De Geer, 1928.

Readings for this phase indicate that the thinning ice took a thousand years to reach the point where it parted in two after pausing in Jämtland. The Post-Glacial period in northern Europe began therefore about 6800 B.C.

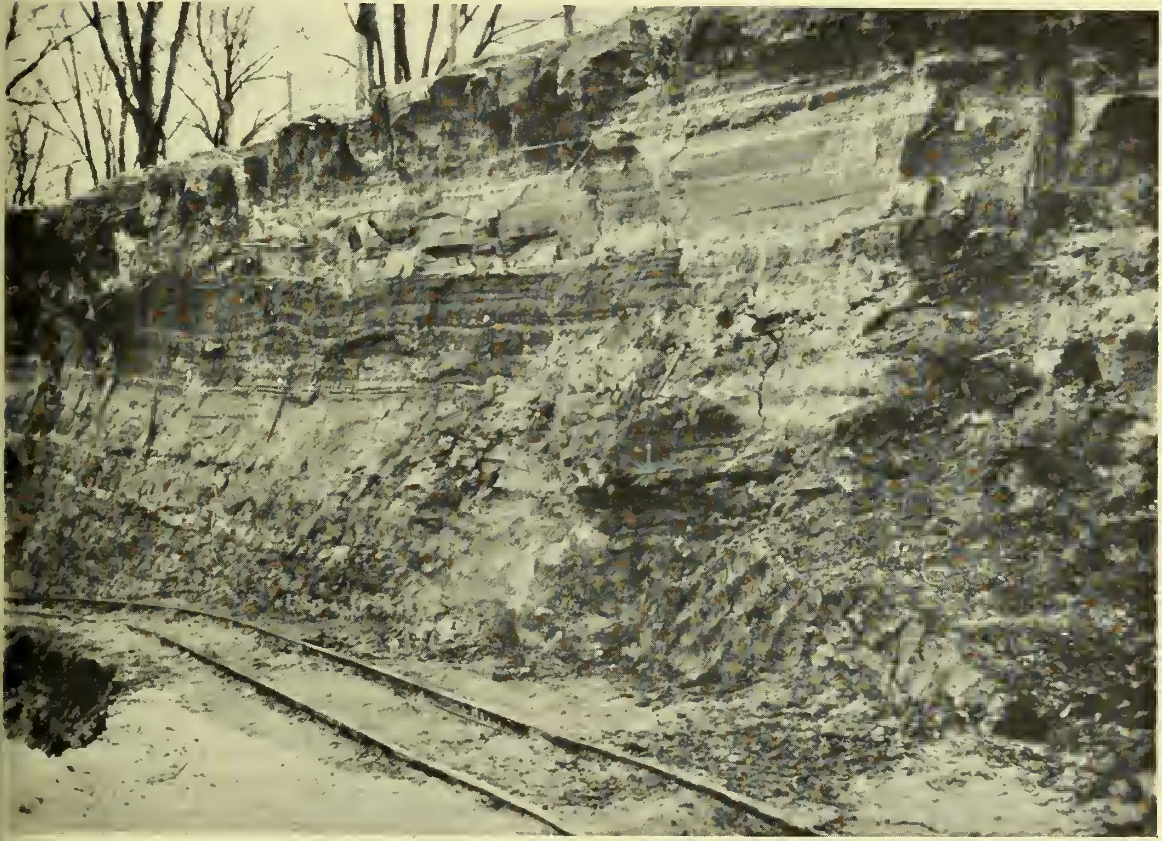

FIG. 18. Sandy varves at Sperenberg near Berlin. (Photograph by F. E. Zeuner.)

This estimate is confirmed by varves laid down since then by the remnant ice in the drained Lake Ragunda. They show that about 8700 years have elapsed to the present time.

(*b*) *Varved clays in the British Isles.* In the British Isles several sections of varved sediments have been noted. Series underlying Scottish Readvance drifts in the north of England[1] have been assigned to the First Period of Retreat. Varves in Silent Valley are probably referable to the equivalent phase in Ireland.[1] Since varves of comparable age are as yet unknown in the Baltic area, no date can be suggested for these English and Irish sediments. The best-known example in Britain, however, is provided by fifty-nine clearly defined laminae laid down near Dunning in lower Strathearn during the retreat which followed the Perth Readvance (pp. 32–33, 42). It has been claimed that the Dunning varves can be linked with those at Lyngby, near Copenhagen, which register part of the Götiglacial retreat.[2] On this basis they must have been laid down between 11,171 and 11,113 B.C., or 4371 to 4313 years before the beginning of the Post-Glacial period in northern Europe. This claim has not been generally accepted,[3] for it is usually held that the withdrawal of the ice after the Perth Readvance is not the correlative of the Götiglacial, but of the Finiglacial Period of retreat in the Baltic area (p. 58, below). Notwithstanding, an immense field is available in the British Isles for the recording of varves by the methods which have yielded such important results in Scandinavia. If varved deposits can really be linked between regions so widely separated, then research ought to lead to the closer correlation of Late-Glacial and Post-Glacial events on both sides of the North Sea.

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[1] Dixon, Madden, Trotter, Hollingsworth, and Tonks, 1926, pp. 50–58, 66–67.

6. THE BALTIC WATER BODIES

1. During the Götiglacial Period the land to the north of the Baltic depression stood below present sea-level and higher in the south-west. As the ice-sheets contracted their melt-waters poured into the great trough and formed a lake. This discharged westward, but was shut off from the Arctic Ocean by the massed ice in the north (Fig. 19 *a*).

2. Soon after the beginning of the Finiglacial Period (*c.* 7800 B.C.) the retreating ice opened a gap to the north into the Arctic Ocean. The level of the water inside the Baltic hollow, into which the melt-waters continued to pour, became the same as that of the outside seas. As a result the spillways in the south-west became sounds admitting salt water. The freshwater organisms died out and were replaced by marine forms. To one of these, the bivalve *Yoldia arctica* Müller, the new, cold and brackish sea of short duration owes its name.

3. Northern Denmark and the region east of it were flooded by the

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[1] Charlesworth, 1939, pp. 270–2.

[2] De Geer, 1935, p. 25.

[3] McCallien, 1935, p. 71; Charlesworth, 1943, p. 89.

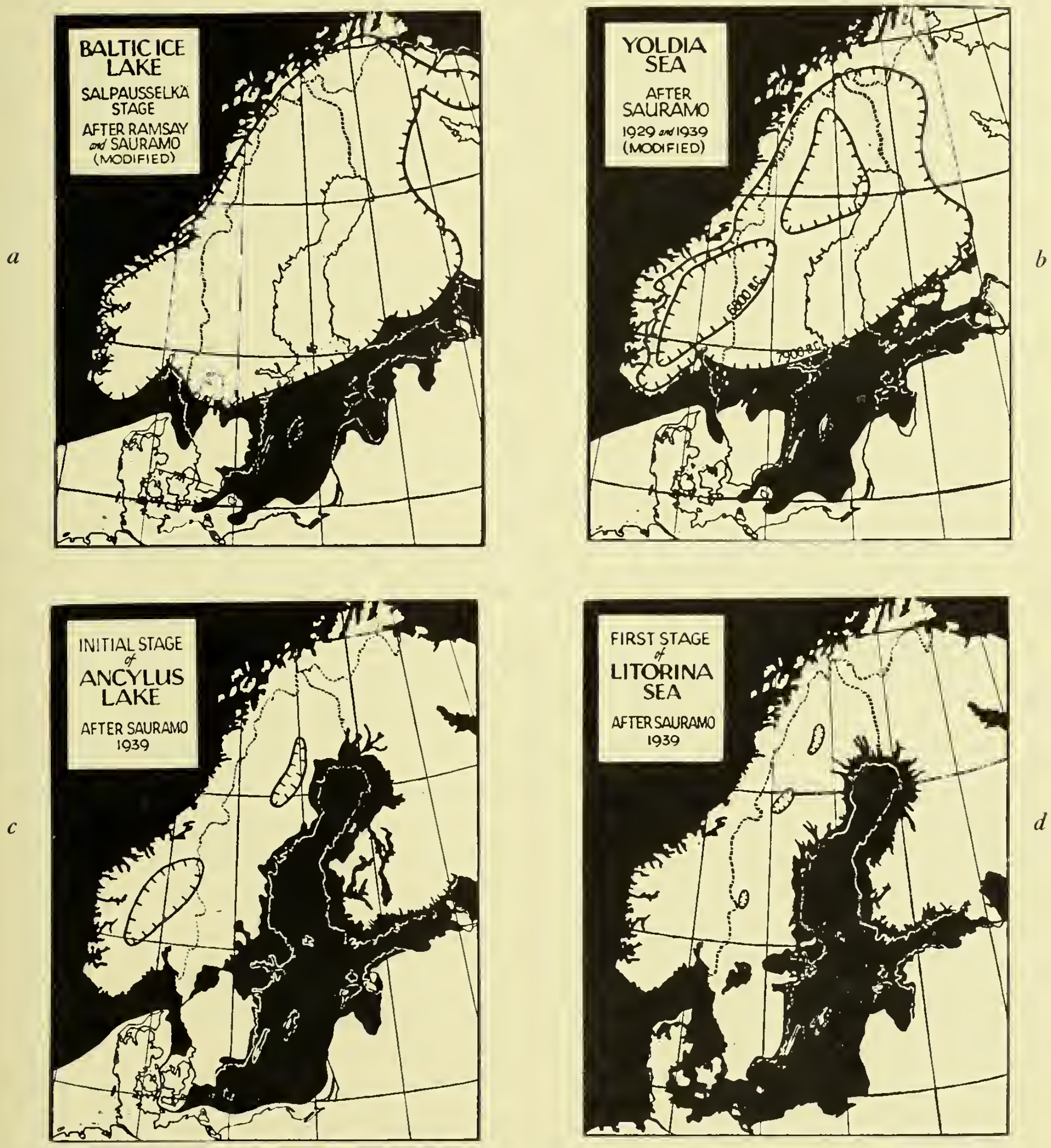
a
BALTIC ICE LAKE
SALPAUSSELKÄ STAGE
AFTER RAMSAY and SAURAMO (MODIFIED)
b
YOLDIA SEA
AFTER SAURAMO 1929 and 1939 (MODIFIED)
6800 B.C.
7900 B.C.
c
INITIAL STAGE of ANCYLUS LAKE
AFTER SAURAMO 1939
d
FIRST STAGE of LITORINA SEA
AFTER SAURAMO 1939

FIG. 19. Maps showing the stages in the development of the Baltic Sea. (Reproduced from Zeuner, 1946, after Ramsay and Sauramo.)

a. Baltic Ice Lake. *b.* Yoldia Sea. *c.* Ancylus Lake. *d.* Litorina Sea.

Yoldia Sea. A strand-line, increasing in elevation to almost 300 metres (nearly 1000 feet) above present sea-level near the ice-centre, records the amount of the marine transgression and the rapid land recovery which followed (Fig. 19 *b*). The zero-isobase passes through the middle of Denmark and along the north coast of Germany.[1] By late Finiglacial time, about 7300 B.C., the uplift had so progressed that the Baltic depression was closed at both ends and once more converted into a lake. This large and long-lasting expanse is called after the freshwater snail *Ancylus fluviatilis* Müller, one of the characteristic fossils in its deposits.

4. The Ancylus Lake at first drained into the North Sea across southern Sweden and received the discharge of the diminishing ice (Fig. 19 *c*). By about 5000 B.C., or nearly two thousand years after the beginning of Post-Glacial time, its level had so risen that, with the eustatic rise of the outside sea, the sill between Jutland and Scania was broken and the waters joined through the Cattegat.

5. With the establishment of this communication and a sinking of the land, a new body of increasing size, depth, and salinity took the place of the Ancylus Lake. It is known as the Litorina Sea (Fig. 19 *d*) from the periwinkle *Littorina littorea* Linn., the shells of which are most abundant among the characteristic group of molluscan fossils in its deposits. The Tapes Sea, its equivalent on the Swedish west coast and in Norway, derives its name from the bivalve *Tapes decussatus* Linn. These Early Post-Glacial seas are thought to have attained their maximum around Denmark about 4500 B.C., and possibly some five hundred years later in Finland. Their transgression of the coasts is registered by a raised beach and other deposits at progressively higher elevations. From a zero-line, corresponding nearly to that of the emergence which succeeded the formation of the Yoldia Sea, they attain over 100 metres (say 330 feet) above present sea-level in the northern part of the Gulf of Bothnia.

6. The subsequent uplift of the land, which began to operate soon after the marine transgression reached its maximum, gradually contracted the sounds and brought up the Baltic lands to their present level. This has been maintained save for a slight intermittent sinking.

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[1] Wright, 1937, map, Pl. XVIII, and pp. 356–8.

7. THE EMERGENCE OF THE SEA-FLOORS

Our acceptance of the Yoldia Sea as the equivalent of the Late-Glacial sea outside leads to the obvious inference that the uplift responsible for the extinction of that water body in the Baltic trough, and the formation therein of the Ancylus Lake, is equatable with the process of land recovery initiated during the retreat of the remnant ice in the British Isles (pp. 39–45). The whole movement, therefore, was far-reaching. It continued until the land away from the ice-centres had risen above its present height relative to the surrounding seas. As a result, the earlier outlines of north-western Europe were partially restored, and Britain was once more united to the Continent at several points.

Owing to the later submergence associated with the development of the Litorina and Tapes Seas, to marine erosion, tidal scour, and the creation of sandbanks, the exact gain of the land is not certainly known. It is probable, however, that the 20-fathom line gives a fair indication of the amount of the uplift (map, Fig. 20).

The territory then reclaimed from the sea included the Dogger Bank. This became a low-lying island on the northern edge of the great alluvial plain traversed by the extended lower courses of the rivers which now flow into the North Sea.

The Strait of Dover was again raised, and at least partial connexion between south-east England and the Continent renewed. To the west the Channel was probably reduced to an arm of the sea which received the lengthened English and French rivers. Among the islands on the British south coast, the Isle of Wight became tied to the mainland and the Scillies were joined together.

On the Atlantic side the uplift had marked effects on the maritime tracts and sea-floors. The shores of the Bristol Channel lay farther out than now, and the elongated Severn coursed between them and emptied into the outer sea. Northward, beyond the capes of Wales and Wexford, the waste of the Pleistocene drifts was exposed on the upraised floor of the Irish Sea, just as it would be on the contemporary North Sea plain. Much of Cardigan Bay became dry land. Anglesey was connected with North Wales and stretched farther westward. To the north, the Isle of Man stood above the elevated sea-bed which enlarged the north-western mainland of England.

The Irish Sea, however, was not wholly converted into dry land, although

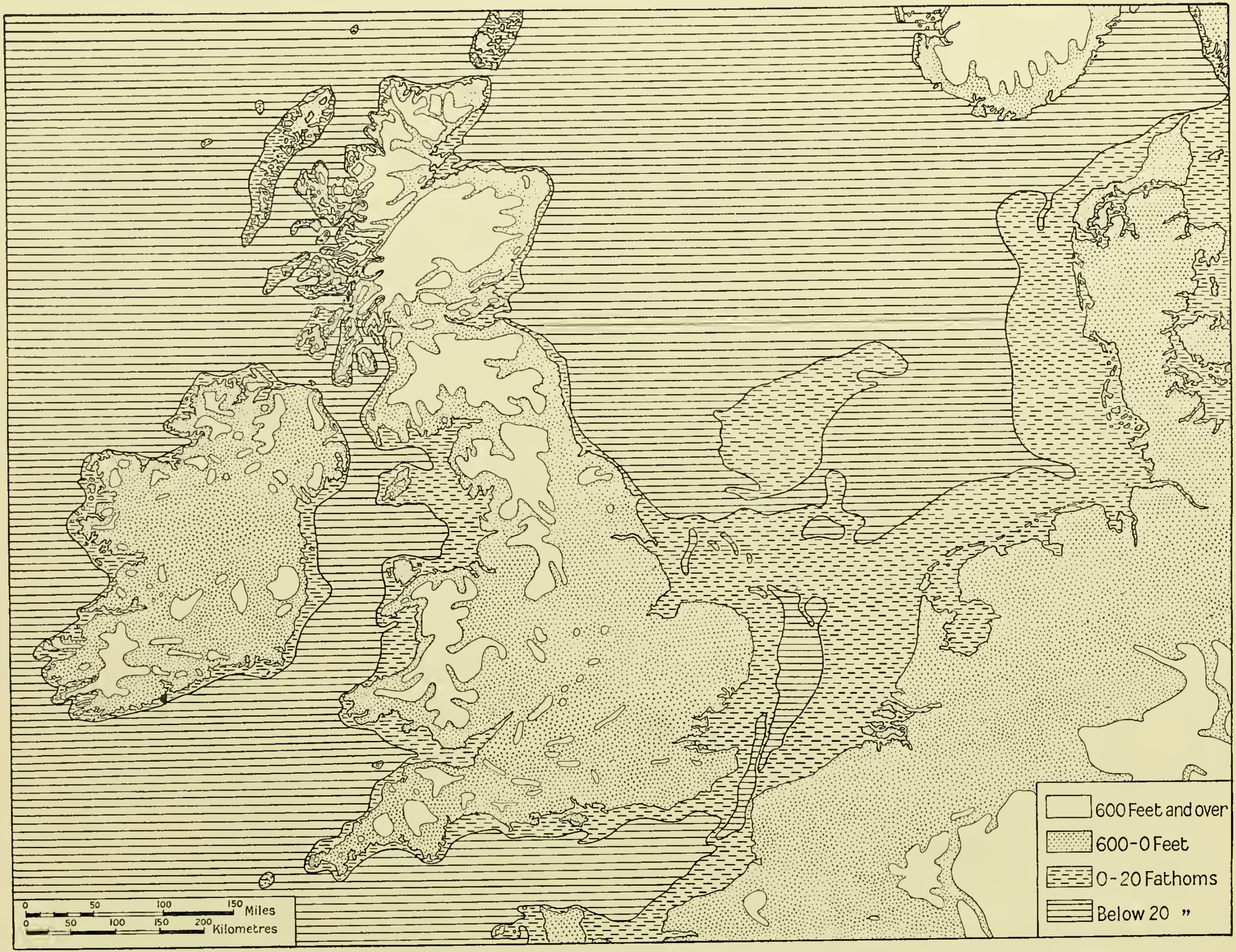

Fig. 20. Map showing probable extent of land recovered from the sea in north-western Europe during the Early Post-Glacial emergence, indicated by the 20-fathom submarine contour.

the low coastal belts were considerably extended. Its bed was trenched by a long gulf occupied by a great river which widened into vast lakes, mainly to the west of the Isle of Man, drained all the surrounding land,[1] and discharged into the sea west of Pembrokeshire. Owing to the presence of the Irish Channel River the connexion between Wales and Ireland was never complete. Nor did the uplift elsewhere afford an unbroken land-bridge between Britain and Ireland. Although the North Channel became narrower, yet it could not have been less than the valley of an immense river.[2] An emergence of less than 30 fathoms might suffice to link north-east Donegal and Islay, but even so the deep Sound of Jura would prevent direct access to the Scottish mainland.[3] Nevertheless, there were intact connexions between many of the islands, some possibly becoming attached to the mainland.

The importance of the emergence is evident. As the climate improved, wide areas were made available for the spread of vegetation. A varied fauna was provided with new feeding-grounds where man could hunt and settle. Routes were laid open between regions formerly widely separated. There indeed existed such obstacles as watercourses, swamps, scrubs, and developing woods, but they were overcome by animals and man. The period was capital in history. It witnessed great movements of peoples and the beginning of human occupation in many parts of the British Isles which had been heavily glaciated.

8. THE EARLY POST-GLACIAL SEA OF SCOTLAND

The Early Post-Glacial eustatic rise in sea-level, which brought to an end the Ancylus Lake in the Baltic trough, and which induced the development of the Litorina and Tapes Seas, had its counterpart outside Scandinavia. One result was that the reclaimed floors of the sea were overwhelmed, and the complete and partial land-connexions, which had been established during the period of emergence, were severed. As in the Baltic basin, so in the British Isles, the re-submergence was most rapid and greatest near the main ice-centres of Late-Glacial times. With it our islands entered upon a new era of separate development.

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[1] Charlesworth, 1930, p. 386.

[2] Hull, 1912, p. 7. It has not been determined whether this fed the Irish Channel River or ran northward into the ocean.

[3] Charlesworth, 1930, pp. 388–9.

The Early Post-Glacial marine transgression affected Scotland, much of Ireland, and the north of England. Although less extensive than that of the Late-Glacial sea, yet it deformed the coasts, enlarged the firths, and converted river mouths into considerable estuaries. Its encroachment on the

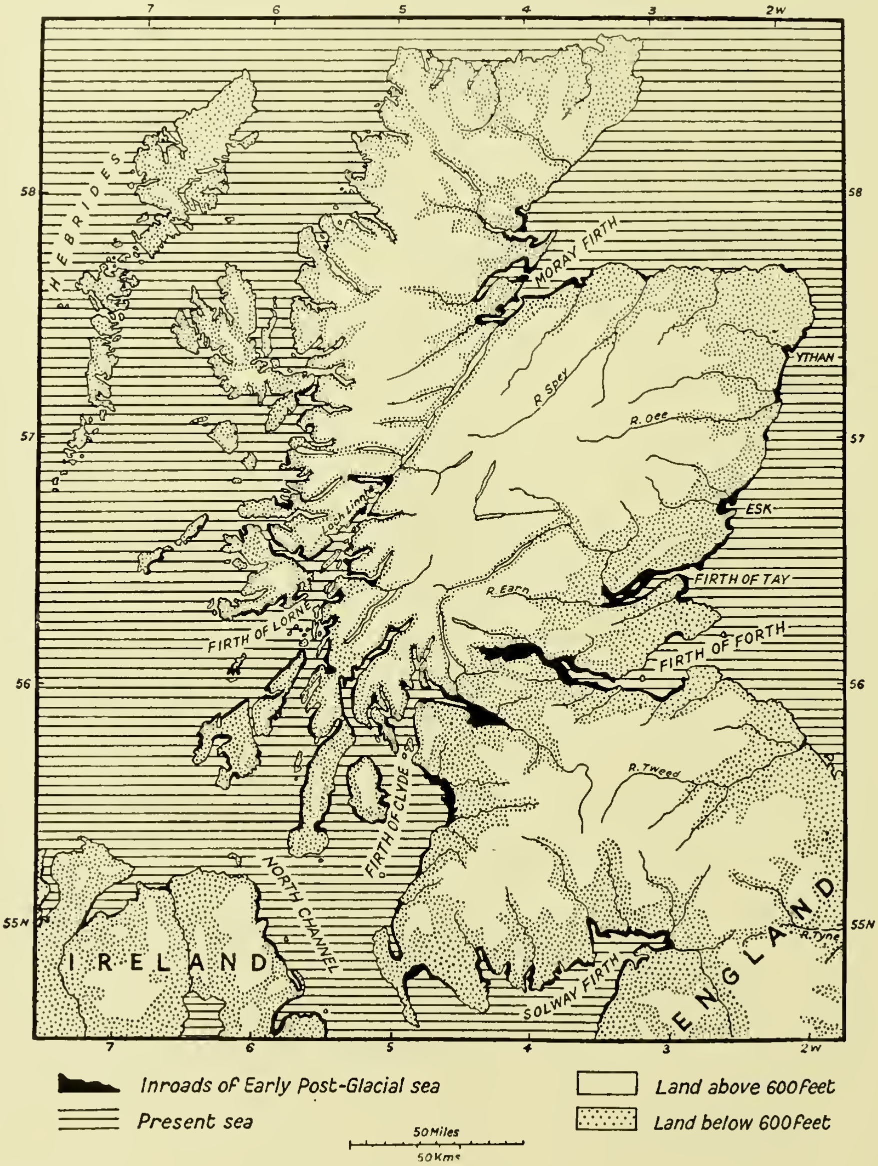
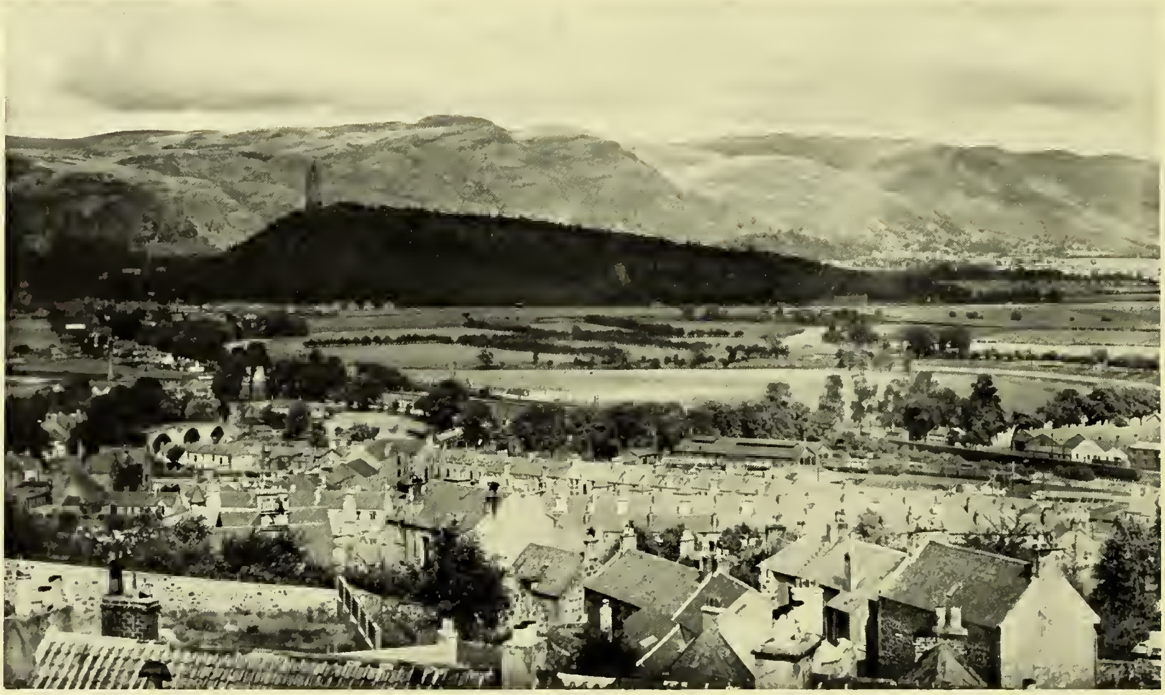
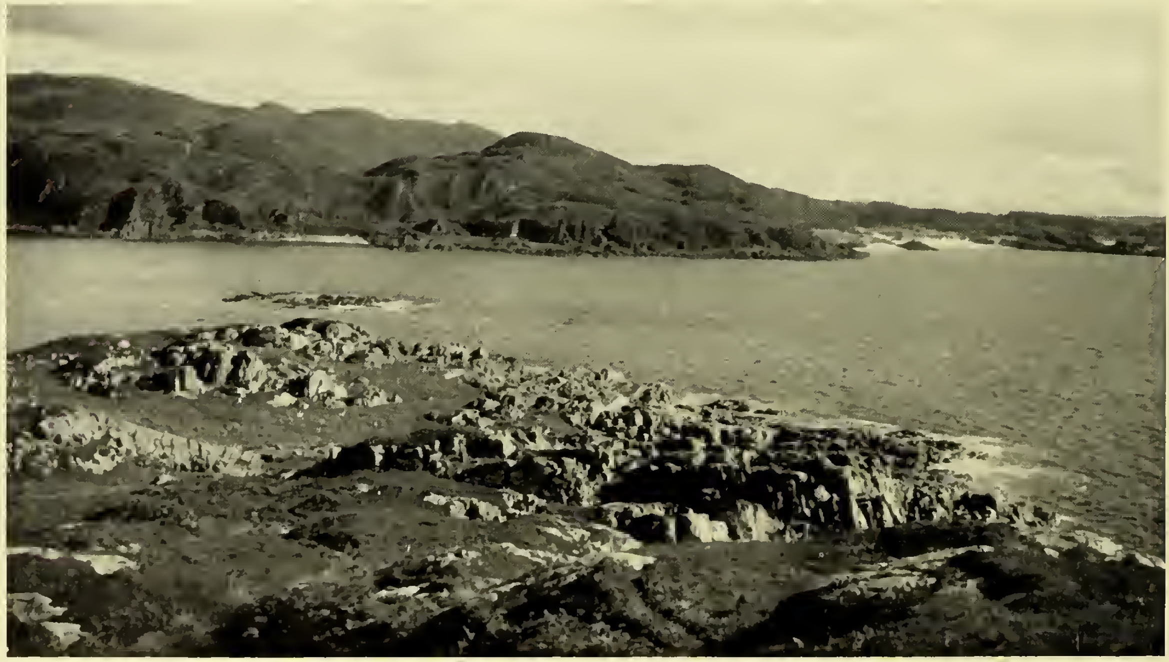


FIG. 21. Map showing the encroachments of the Early Post-Glacial sea in Scotland.



(*a*) THE ESTUARINE FLATS OF FORTH, VIEWED EASTWARD (DOWN VALLEY) FROM STIRLING CASTLE OPPOSITE ABBEY CRAIG

(*By permission of British Railways.*)



(*b*) THE EARLY POST-GLACIAL RAISED BEACH ON THE SOUTH SIDE OF THE MORAR ESTUARY, INVERNESS-SHIRE
Seen as a low terrace fringing the opposite shore. On the right are the white sands and dunes fronting an occupation-site in the extinct bay at Rudha'n Achaidh Mhòir.

Forth and Clyde basins narrowed the land-connexions between the Highlands and the south (map, Fig. 21).

9. THE EARLY POST-GLACIAL RAISED BEACH OF SCOTLAND

The Early Post-Glacial marine transgression was responsible for the formation of the raised beach which is the most marked feature of the seaboard of Scotland and north-eastern Ireland. It laid down silts and other sediments in bays and sea-lochs. To it are due also the carse-clays of certain estuaries, notably Clyde, Forth (Pl. II *a*), Tay, Esk (Angus), and Ythan, Aberdeenshire.

The raised beach, equivalent platform, or deposit which registers the Early Post-Glacial submergence, and upon which stand countless villages and towns, is commonly called the 25-foot raised beach. This is a misnomer, because its elevation is by no means constant. When its varying elevation was recognized and explained, the designation *Early Neolithic* was suggested[1] because it was believed that its contained relics of human industry were referable to that period. A later proposal to call the feature the *Mesolithic Beach*[2] is based on the surer foundation of present archaeological knowledge. Recently it has been suggested[3] that a more appropriate name would be *Litorina Beach* after the corresponding formation in the Baltic areas, since in both the same periwinkle *Littorina littorea* Linn. occurs as the characteristic fossil. To the writer it seems at present undesirable to confuse a British coastal feature with a memorial of a submergence in the Baltic trough. For this reason, the beach, which is of supreme importance to Scottish geology and archaeology, is referred to in these pages as the *Early Post-Glacial raised beach.*

It attains about 50 feet at Gartmore in the upper Forth valley,[4] in the basin of the Tay above Perth, and below Crieff in Strathearn.[5] In the west the beach stands about 40 feet above present high-water mark between Loch Linnhe and the Firth of Clyde.[6] Outward it decreases to present sea-level in Caithness and the Western Isles, in Co. Durham and Lancashire, in North Wales, and south of Dublin and Co. Sligo in Ireland. A curve joining these points and forming the zero-isobase approximates to that which denotes the maximum of the Late-Glacial sea (pp. 39–41 and Fig. 14).

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[1] Wright, 1928, p. 99.

[2] McCallien, 1937 (*a*), p. 196.

[3] Movius, 1942, p. 86.

[4] Dinham, 1927, p. 490.

[5] J. Geikie, 1881, p. 383; Simpson, 1933, p. 640.

[6] McCallien, 1937 (*a*), p. 198.

It excludes the Orkneys, where the raised beach, if it ever existed, is now submerged. Thus, in the British Isles, as in the Baltic region, the recoil subsequent to the marine invasion was greatest around the ice-centre of Late-Glacial times.

Locally the Early Post-Glacial raised beach is dotted with crags and stacks, or its inner margin shelves against a characteristic scarped cliff perforated with caves (Pl. II *b*). At such places it is easy for the spectator to visualize the coast-line as it was at the time of the maximum submergence. The Early Post-Glacial raised beach represents a period of erosion and deposition probably longer than that of the sea at approximately its present level. Yet it is doubtful if even the whole platform attributed to the Early Post-Glacial sea was everywhere cut by it, though it hewed, carved, and wasted rocks. The presence of ice-striated rocks upon its surface suggests that the terrace may be of pre-glacial or interglacial age, and that it is a coincidence that the beach rests upon an earlier sea-level.[1]

In the lower reaches of many of the larger rivers the raised beach or its equivalents, for example, the estuarine flats, merge into the terrace formed by the stream in adjusting its base-level.

The deposits which record the transgression of the Early Post-Glacial sea have a stronger claim to attention for other reasons than their arresting character. Within or upon them occur the earliest unquestionable relics of man in Scotland. Broadly speaking, those recovered from inside the formation which records the marine invasion date back to the end of the Early Post-Glacial emergence or the beginning of the subsequent relative land-sinking. The relics from the top of the raised beach as a rule denote settlement after the succeeding movement of land recovery had set in.

The movement of land recovery, initiated soon after the Early Post-Glacial sea attained its maximum, continued until about the Iron Age. Minor raised beaches occurring locally below the main Early Post-Glacial formation indicate that in Scotland, as in the Baltic area (p. 50), the process was irregular. When this is better understood it should help to explain the mode of occurrence of dug-out canoes recovered from the carse-clays of the Forth, and of those found deep down in and around Glasgow, which have so long been a problem to geologists and archaeologists.[2] Though inconsiderable compared with that which attended the final melting of the ice, yet this uplift forced the rivers to adjust once more their lower courses.

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[1] McCallien, 1937 (*a*), p. 197.

[2] Munro, 1899, pp. 70–71.

That a relative land-sinking has since taken place is attested by prehistoric remains now under water at several points on the coasts of the British Isles and adjacent Continent.[1] The evidence points to a submergence greater outside than inside the zero-isobase of the Early Post-Glacial raised beach.[2]

10. CORRELATIONS

1. Since no great distance separated the principal ice-centres, powerful oscillations could hardly have affected one area and not the others. Hence, despite many difficulties, it seems that the main events of the deglaciation in the British Isles and in the Baltic basin can be correlated.

Our datum lies in the period of climatic improvement preceding the New Drift Glaciation of the British Isles.[3] It permits us to link this glaciation, the last great drive of the Scandinavian ice-sheets across the North Sea, the concomitant Weichsel advance over Denmark and north Germany, and the second Würm maximum in the Alps. As in the British Isles and the Alps, so in the lands dominated by the Fenno-Scandian ice, series of moraines indicate that the subsequent retreat was interrupted. The episodes which they represent on both sides of the North Sea show more than apparent agreement, although the movements and attendant phenomena may not have been synchronous.

2. The thinning back of the New Drift ice to the borders of the Scottish Midland Valley, the withdrawal of the Scandinavian ice-sheets from the British east coast, and the retreat of the Fenno-Scandian ice from the Brandenburg End-Moraine reached at the peak of the Weichsel glaciation, may be assigned to the same initial phase of thaw. To this would belong also the Achen (W_2/W_3) retreat of the Alpine glaciers, corresponding to the Daniglacial Period in the Baltic area.

3. The arresting of the retreat by the Scottish Readvance and associated movements in the British Isles, recorded by the North-east Ireland–Isle of Man–Cumberland End-Moraine, may be correlated with the pause or readvance marked by the Baltic or Pomeranian End-Moraine which terminated the Daniglacial Period.[4] Whereas in Britain the episode was a

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[1] Munro, 1898, pp. 263–6; Movius, 1942, pp. 288–93.

[2] Callander, 1929, pp. 316–22.

[3] Charlesworth, 1929, p. 351; Lacaille, 1946, pp. 77–78.

[4] Charlesworth, 1926(*b*), pp. 49–50.

considerable glaciation, its Alpine equivalent, the Bühl or third Würm maximum, was of local significance only.

4. The counterparts of the Scottish deposits which register the withdrawal of the ice by stages during the second period of retreat lie in a series of moraines in southern Sweden and Finland referable to the Götiglacial Period or Scanian Substage. This would correspond to the Bühl–Gschnitz Period in the Alps.

The development of the Baltic Ice-dammed Lake during the Götiglacial Period synchronized with that of the Late-Glacial sea outside the Baltic depression. This sea, marked in Scotland by a raised beach, platform, or notch attaining a maximum elevation of 155 feet above O.D., had a later counterpart in the Yoldia Sea of the early Finiglacial Period.

5. The cold seas witnessed the last important change of the glacial episodes and the end of the second period of retreat in Scotland and the Baltic lands. South of the Forth the principal event is denoted by the Lammermuir–Stranraer Moraine, and north of the Midland Valley by the relics of the protracted District, Valley, or Moraine Glaciation. As the Scottish glaciers were locally in contact with the swollen sea, so was the diminishing Fenno-Scandian ice. Among the many Scottish movements of the time, the Perth Readvance has been correlated with the halt responsible for laying down the Fenno-Scandian End-Moraines and closing the Götiglacial Period.[1] The Alpine representative of this stage would be the Gschnitz Stadium.

6. From the above it appears that the melting of the ice in Scotland after the District, Valley, or Moraine Glaciation may be correlated with the Finiglacial Period of recession in Fenno-Scandia, and with the Gschnitz–Daun retreat of the glaciers in the Alps. This is upheld by the evidence of land recovery on both sides of the North Sea, which process culminated in the emergence of the sea-floors, and with other factors brought about the enclosing of the Ancylus Lake in the Baltic trough towards the end of the Finiglacial Period.

According to the scheme of Penck and Brückner, Post-Glacial time in the Alps opened with the Gschnitz–Daun period and, therefore, earlier than in Scandinavian countries. In the parts of the British Isles long vacated by the ice, conditions naturally improved earlier than in Scotland. Although the Scottish ice-cap was lighter than the Fenno-Scandian, the latitude of

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[1] Simpson, 1933, p. 640.

TABLE II

A correlation of the main events of the deglaciation in Britain, the Baltic basin, and the Alps.

	Dates approx. B.C.	BRITAIN			BALTIC			ALPS
		Ice-movements		Land and Sea	Ice-movements	Water bodies		
POST-GLACIAL	– 2500 –	*THIRD AND FINAL RETREAT*	Emergence	Sea as at present		Baltic Sea	Emergence	
	– 5000 –		Submergence	Transgression of the sea-floors; invasion of the coasts and estuaries by the sea		Litorina Sea	Submergence	
	– 6800 –		Emergence	Land-connexions between Britain and the Continent	Bipartition of the ice at Lake Ragunda (Final pause; Jämtland Moraines)	Ancylus Lake	Emergence	Daun Stadium?
LATE-GLACIAL	– 7300 –							
	– 7800 –		Submergence	Late-Glacial Sea	*Finiglacial Period (Bothnian Substage)*	Yoldia Sea	Submergence	*Gschnitz-Daun*
	– 8300 –	DISTRICT, VALLEY OR MORAINE GLACIATION (Perth Readvance, etc.)			Fenno-Scandian End-Moraines Inner Ra and Salpausselkä Moraines	Ice-dammed Lake		Gschnitz Stadium
	– 14800 –	*SECOND RETREAT*			*Götiglacial Period (Scanian Substage) Outer Ra and Salpausselkä Moraines*			*Bühl-Gschnitz*
	– 18000 –	SCOTTISH READVANCE (North-east Ireland–Isle of Man–Cumberland Moraine)			Baltic End-Moraine (Pomeranian Stage)			Würm III (Bühl)
		FIRST RETREAT			*Daniglacial Period (German Substage) Withdrawal of Scandinavian ice-sheets from British east coast*			*Achen Retreat* (W_2/W_3)
		NEW DRIFT			Weichsel Glaciation (Brandenburg End-Moraine); Scandinavian ice-sheets along British east coast			Würm II

Scotland has to be taken into account. Nevertheless, by the end of the Finiglacial Period the Scottish ice had probably melted away. The small glaciers said to have stirred late high up in the mountains (p. 33) may have been in response to the oscillation which arrested briefly the retreat in Jämtland and terminated the Finiglacial Period.[1] That stage immediately before the bipartition of the ice at Lake Ragunda, marking the beginning of Post-Glacial time in northern Europe, may be represented in the Alps by the Daun Stadium.[2]

7. The correlative of the Litorina Sea, which succeeded the Ancylus Lake early in the Post-Glacial period, was the general submergence of the land recovered from the sea outside the Baltic depression during the preceding period of uplift. It comprised the Flandrian transgression which created the English Channel, the complete drowning of the North Sea and the Irish Sea beds, and the marine invasion of the coasts around the principal ice-centres of the British Isles. The encroachments of the Early Post-Glacial sea in the Baltic area and British Isles are most clearly registered by a raised beach, attaining its maximum elevation around the ice-centres. The subsequent emergence of the land around the British Isles had its counterpart in the movement whereby the Litorina Sea was reduced and the present Baltic Sea came into existence.

8. These tentative correlations are set out in the preceding table (Table II, p. 59).

[1] An alternative suggests itself, if such movements did in fact take place. They may have been in response to local oscillations after the events mentioned in these pages. This possibility should not be overlooked when one comes to consider certain remains of arctic animals associated with relics of man from caves in Sutherland (Lacaille, 1946, pp. 78–79; above, p. 29).

[2] Clark, 1936 (*a*), p. 2. It is understood, however, that the true place of the Daun Stadium has not been satisfactorily determined.

III

THE CHRONOLOGY OF THE DEGLACIATION

1. INTRODUCTION

THE deglaciation of the Northern Hemisphere was followed by an improvement of climate and an increase in vegetation. On the main Continent and in the regions which had not been directly invaded by late advances of the ice, the tundra shrank and gave place to steppes, meadows, and forests. In the British Isles and the Baltic countries an arctic flora gradually clothed the areas vacated by the ice, and as this melted away, so a richer flora and eventually forest trees appeared.

2. CLIMATIC CHANGES

(*a*) *Pollen-analysis.* It was long ago recognized that at no remote geological period the whole of Scotland within and without the borders of the Highlands, the Shetlands, Orkneys, and Hebrides, supported immense woods. The fact is evident; for travel where one will over desolate moorlands, one finds the remains of trees great and small exposed in the sides of rent and wasted peat-hags (Fig. 22).

As far back as the nineteenth century Scottish geologists concluded from their studies of peat layers and two distinct forest beds that the climate did not recover from arctic conditions in a regular manner. It has, however, been left to Scandinavian scientists to exploit the discovery that, by examining and counting the pollen grains of forest trees preserved in peat, a more accurate picture of these changes is obtained. The importance of pollen-analysis is evident, for the linking of the botanical, zoological, and archaeological findings with the geochronological scale based on varved clays gives a fairly complete history of the Late-Glacial and Early Post-Glacial periods.

Such pollen-analyses as have been carried out in Scotland tell little of the earlier passage from arctic conditions, but prove more informative for the later periods. This country affords unrivalled scope for the application of these critical methods. It is confidently expected, therefore, that when investigations are extended the pollen sequence will be narrowed into zones, as in Denmark and parts of England and Ireland.

(*b*) *The sequence.* The climatic succession in Scotland from the Late-

Glacial period onward, as in other parts of the British Isles, corresponds closely to that established in the Baltic area. It points to the contemporaneity of the different changes in both regions.

There is evidence from northern Europe[1] to show that climatic fluctuations followed the Late-Glacial severities. These fluctuations were (1) a sub-arctic phase, the *Early* or *Lower Dryas Period* (Zone I), when tundra conditions prevailed; (2) a phase of amelioration, the Allerød Oscillation (Zone II) belonging to the end of the Götiglacial Period of retreat, which allowed the growth of willow, birch, and some pine; (3) a sub-arctic phase, the *Late* or *Upper Dryas Period* (Zone III), marked by a flora similar to, but rather more abundant than, that of Zone I, which indicated a temporary return to cold, and which probably synchronized with the halt of the ice along the line of the Fenno-Scandian End-Moraines. A like sequence is represented in Ireland[2] and England.[3] From the following pages it will appear that the same order ruled in Scotland, though this has not yet been so finely determined.

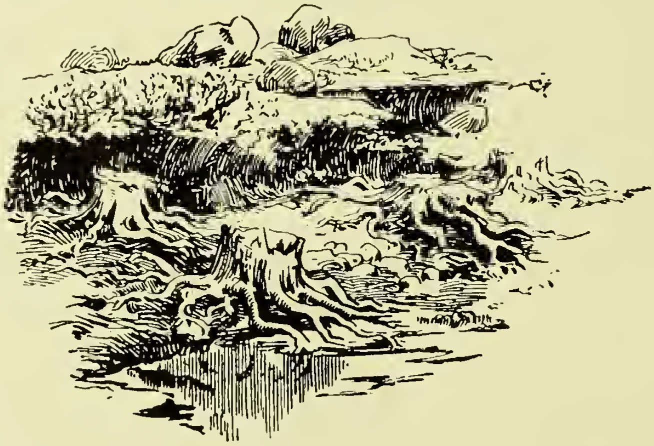

FIG. 22. Tree-roots in the peat on Rannoch Moor. (By permission of British Railways, from '*Mountain Moor and Loch*', 1894.)

After the second spell of sub-arctic conditions in Late-Glacial times the climate improved under a rising temperature until the optimum was reached in the Early Post-Glacial period. The phase of transition, known as the *Pre-Boreal* (Zone IV in northern Europe and Ireland), was marked by an increasing vegetation. On both sides of the North Sea the Post-Glacial climate was composed of four well-defined phases which represented a twice-repeated cycle of dry and wet conditions. Beginning with the oldest, these phases were: (1) *Boreal*, dry continental climate; (2) *Atlantic*, warm, moist insular climate; (3) *Sub-Boreal*, renewed continental climate; (4) *Sub-Atlantic*, return to damp, colder climate.

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[1] Jessen, 1935, 1938.
[2] Jessen and Farrington, 1938.
[3] Godwin, 1940.

Pollen-analysis in the Baltic basin and north-east Ireland enables the Boreal and the succeeding phases to be subdivided into several zones. Thus, in northern Europe the Early Boreal falls within Zone V and the Late Boreal within Zone VI; Early Atlantic is Zone VII; Zone VIII covers the Late Atlantic and Sub-Boreal, and Zone IX is the Sub-Atlantic. The results of investigations in Ireland, which have been summarized recently,[1] show close agreement with the Continental order. In Ireland the Boreal admits of two sub-zones: Early, V *a*, and Late, V *b*, the latter covering also the Early Atlantic. So far as is now known, the remainder of the Atlantic, and at least part of the Sub-Boreal phase, come within Zone VI, which would therefore synchronize with Zone VIII in Denmark.

Figs. 23, 24, and 25, which refer to Scotland, show two of the methods used to illustrate the results of pollen-analysis. Symbols represent the different trees. Hazel (*Corylus*) is reckoned separately and is expressed as a percentage of the total tree pollen present.

3. THE FORESTS

1. The Pre-Boreal climatic phase (*c.* 7800–6800 B.C.) covered the Finiglacial Period of retreat in the Baltic area. It witnessed the early coming of willow (*Salix*), the maximum growth of birch (*Betula*), the gradual rise of pine (*Pinus*), and the introduction of aspen (*Populus tremula* Linn.) and hazel. The phase coincided at first with the Yoldia Sea and later with the uplift of the land whereby the Ancylus Lake was enclosed. It was marked by similar developments in the flora of the British Isles, while the remnant ice melted away and the land gradually rose. By the end of this phase connexions existed between Britain and the Continent. Pollen-analysis indicates the Late Pre-Boreal or Early Boreal age of the peat, or moorlog, from the Dogger Bank and other shoals which prove the reality of the emergence.[2] That the deposit was formed in a freshwater fen away from the sea is shown by its contained plant and beetle remains.[3]

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[1] Movius, 1942, pp. 89–100.

[2] Erdtman, 1924, pp. 677–8; Godwin, 1934, p. 340.

[3] Reid, 1913, pp. 41–73.

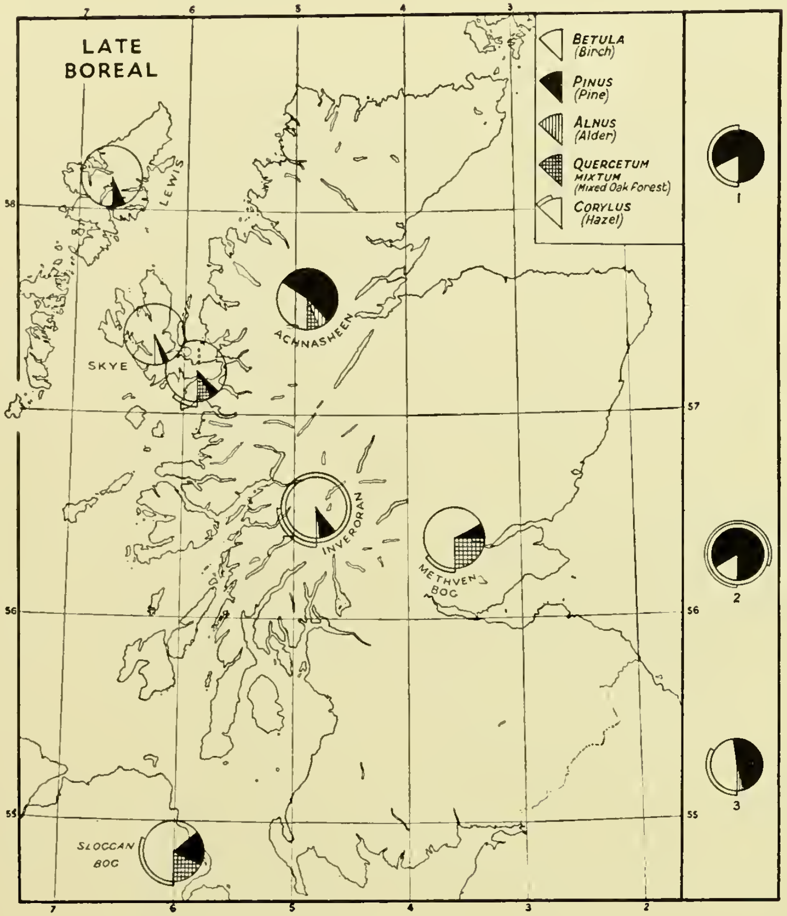

FIG. 23.

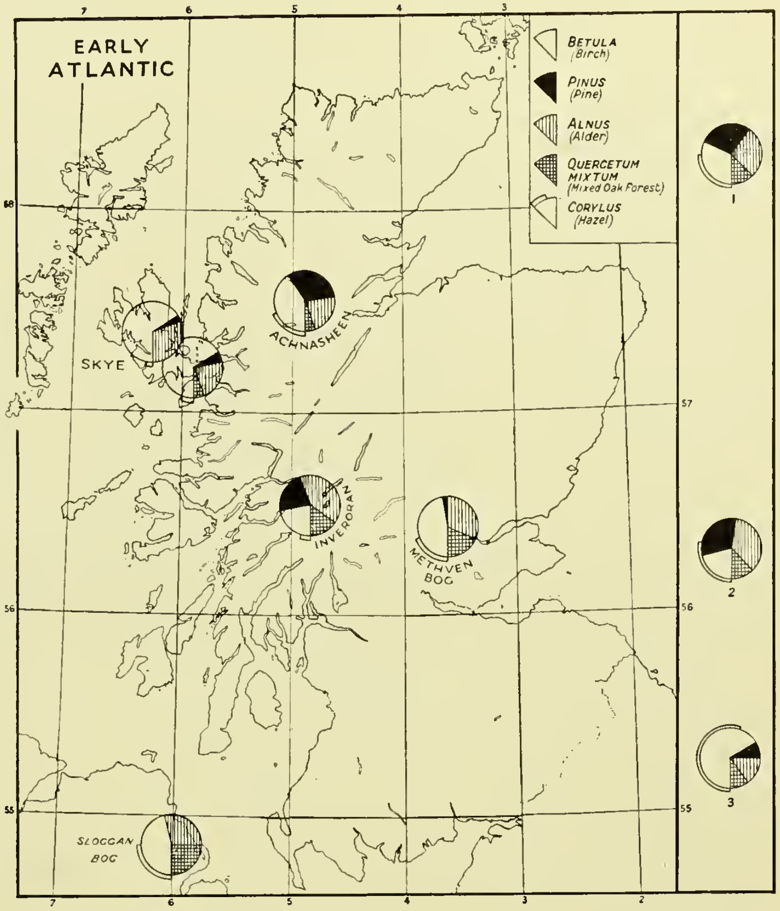

FIG. 24.

FIGS. 23 and 24. Diagrams showing the percentage pollen composition of Late Boreal (Fig. 23) or Early Atlantic (Fig. 24) age from sites in Scotland. The criterion of the Boreal–Atlantic transition has been taken as the intersection of the falling pine and rising alder pollen-curves. The percentages of the different types of pollen shown are indicated in clockwise order, and the size of each sector is proportional to the percentage of each type of tree pollen present. Hazel pollen is reckoned separately and expressed as a percentage of the total tree pollen. On the right of each figure are analyses of comparable age from (1) Göteborg, Sweden; (2) Schona, South Sweden; (3) Zeeland, Denmark—shown approximately at their proper latitude.

(Redrawn from Godwin, 1940.)

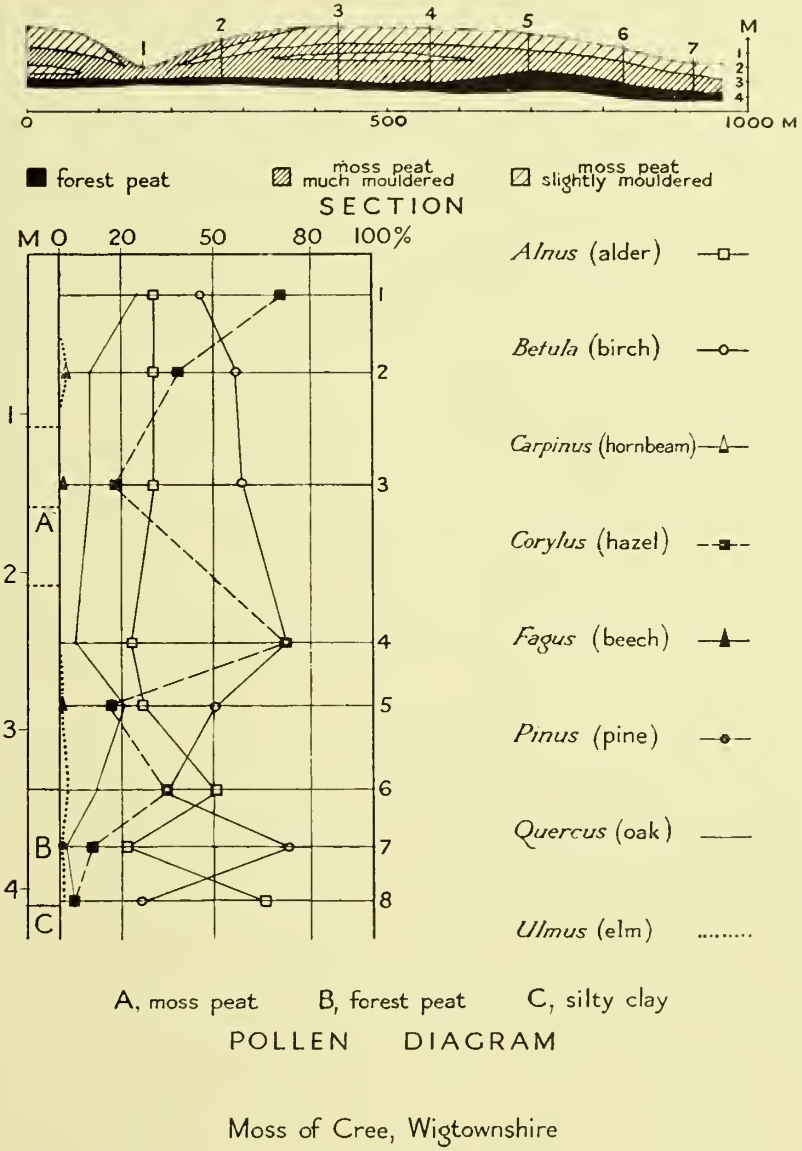

FIG. 25. Pollen-analyses of peat samples from the beds overlying the Early Post-Glacial raised beach at Moss of Cree, Wigtownshire. (Based on Erdtman, 1928.)

2. The beginning of the succeeding Boreal climatic phase (*c.* 6800–5000 B.C.) synchronized with the opening of Post-Glacial time in northern Europe. The phase, marked by a rapidly rising temperature, was contemporary with the main development of the Ancylus Lake in the Baltic trough, and therefore with the maximum emergence of the sea-floors outside Scandinavia and around the British Isles. Over an enlarged northern and north-western Europe dry continental conditions prevailed and induced the widespread growth of forests. Pine became dominant in Denmark during the early part of the Boreal phase; later such deciduous trees as oak (*Quercus*), elm (*Ulmus*), and lime (*Tilia*) appeared. Hazel attained its maximum, flourishing at heights and in latitudes where it is no longer found. The British Isles, including their extended coastal grounds, became clad with forests. In Scotland these at first consisted mainly of birch and pine, to which were added later a dense undergrowth of hazel, some alder (*Alnus*), oak, and elm. At least one-fourth of the country became wooded even to altitudes, and in regions, now treeless, notably in the west and north, the Hebrides, Orkneys, and Shetlands. Changing conditions in the later stages of the Boreal phase led to the formation of peat at aquatic sites in Scotland.[1]

It was towards the end of this phase that the land-bridge between Sweden and Denmark was broken and the Litorina Sea came into existence. About the same time the submergence of the connexions between the Continent and Britain was initiated, and the tracts upraised around these islands during the preceding climatic phase began to be drowned.

A dug-out canoe of pine has been reported from Friarton, Perth, in the Tay basin, lying under the carse-clay and upon the peat layer,[2] a former land-surface crowded with roots (Fig. 26, iii). While this bed is of Boreal age,[3] it is quite improbable that the boat dates back so far.[4] It is likely that similar craft recorded also from the carse-lands on both banks of the Forth estuary below Stirling[5]—as also the canoes from the sediments of the Clyde[6]—may be assigned to an undetermined minor sinking which occured later than the main invasion of the Early Post-Glacial sea during the Atlantic climatic phase.

3. The Atlantic climatic phase (*c.* 5000–2500 B.C.) coincided with the

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[1] Fraser, 1943, pp. 17–18.

[2] J. Geikie, 1881, pp. 391–2.

[3] Erdtman, 1928, pp. 181–2.

[4] Cf. Clark, 1936 (*a*), p. 109.

[5] Munro, 1899, p. 66.

[6] Ibid., pp. 70–71; and above, p. 56.

occupation of the Baltic basin by the Litorina Sea, and with the equivalent transgression of the reclaimed sea-floors and coastal grounds of north-western Europe. During the first half of the phase the Post-Glacial climatic optimum was attained. It synchronized with the maximum of the high-level seas, the rising of which drowned trees and other vegetation growing on the land recovered during the emergence.

Under marine influence moist conditions combined with the warmth to encourage the spread of deciduous trees. Save in the highest and northernmost parts of Scandinavia a mixed forest replaced pine. Its most important constituents were oak and elm, with the later introduction of maple (*Acer*) and lime. There were similar developments in the British Isles where pine died out in many parts. At first the Mixed-Oak-Forest (*Quercetum mixtum*), which included alder, hazel, and birch, made some progress in Scotland. But in this comparatively small country surrounded by an enlarged sea, the climatic conditions of the Atlantic phase proved detrimental to its increase. Excessive winds and rains initiated the deforestation of Scotland and adjacent islands, and induced the rapid formation of peat-mosses. In fact, in some of the archipelagos the climate deteriorated so much that in the Shetlands, at least, arctic alpine plants grew down to sea-level; since then these islands have been treeless. Locally it brought about an increased precipitation at high altitudes which gave rise to almost glacial conditions.[1]

4. The Sub-Boreal climatic phase (*c.* 2500–850 B.C.) witnessed the progress of land recovery which had begun during the preceding phase. Under the influence of its cooler and drier conditions the Mixed-Oak-Forest decreased and pine attained a second maximum in Scandinavia. Hornbeam (*Carpinus*) and beech (*Fagus*) appeared there later. In many regions the new forest became established on the compact layer (the *Grenzhorizont* of the Baltic lands) formed by the drying and hardening of the surface of the Atlantic peat. In others the equivalent formation supported only grasses and heath. This was particularly so in Scotland, where moors developed rather than woods. Nevertheless, a mixed forest again spread in Scotland, but only on the mainland, where some trees reached up to 3,200 feet above present sea-level.[2] In it birch and alder were fairly abundant, but not elm. Oak did not establish itself generally, though it was actually more frequent than pine, which grew up on the higher grounds.

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[1] Childe, 1935, p. 11.

[2] Fraser, 1943, p. 16.

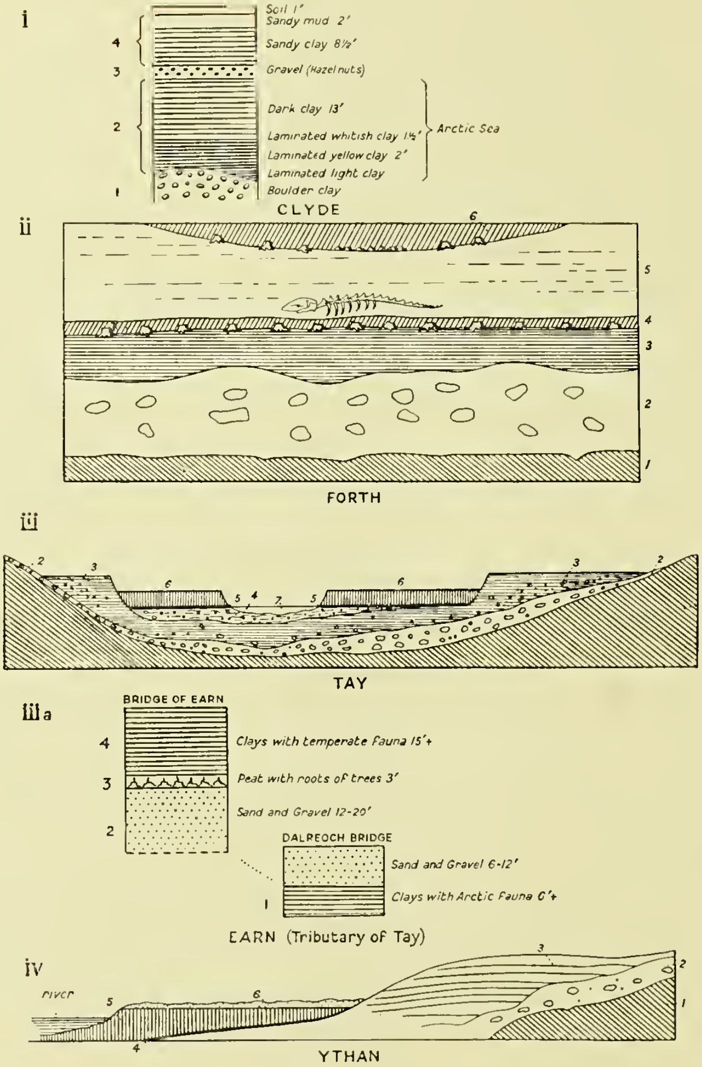


FIG. 26. Sections in the estuaries of Clyde, Forth, Tay, and Ythan, showing sequence from the last glaciation to Post-Glacial. (See Key, p. 69.)

i—CLYDE: Abbey Mills, Paisley, Renfrewshire. (By courtesy of Dr. M. Macgregor.)

	Deposit	*Interpretation*
	Soil	
4.	Sandy clay and sandy mud	*D*
3.	Gravel (hazel-nuts)	*C*
2.	Clays, arctic sea	*B*
1.	Boulder clay	*A*

ii—FORTH: Blair Drummond Moss, Perthshire. (Redrawn from Jamieson, 1865.)

Deposit	*Interpretation*
6. Peat with remains of old wooden road and stools of oak in lower part	*E* and *F*
5. Carse-clay with bones of whale	*D*
4. Peat with remains of trees	*C*
3. Late-Glacial marine beds	*B*
2. Boulder clay	*A*
1. Sandstone-rock	

iii—TAY: Carse of Gowrie, Perthshire. (Redrawn from J. Geikie, 1894.)

Deposit	*Interpretation*
7. Recent alluvia	
6. Carse-clay containing animal bones	*D*
5. Peat with hazel-nuts and remains of trees	*C*
4. River sand and gravel	(*passage from B to C*)
3. Marine clays, '100-ft. terrace'	*B*
2. Boulder clay	*A*
1. Rock	

iii a—EARN (tributary of Tay): Bridge of Earn and Dalreoch Bridge, Perthshire. (By courtesy of Dr. M. Macgregor.)

Deposit	*Interpretation*
4. Clays with temperate fauna	*D*
3. Peat with roots of trees	*C*
2. Sand and gravel	(*passage from B to C*)
1. Clays with arctic fauna	*B*

iv—YTHAN: Aberdeenshire. (Redrawn from Jamieson, 1865.)

Deposit	*Interpretation*
6. Blown sand, &c. (added)	*E* and *F*
5. Estuarine mud with shells	*D*
4. Peat	*C*
3. Stratified clay and sand, or glacial-marine beds	*B*
2. Boulder earth or glacier-mud	*A*
1. Gneiss-rock	

KEY TO THE CLIMATIC SEQUENCE IN FIGS. 26, 27, 28, 29, and 32.

F	Sub-Atlantic age.
E	Emergence; Sub-Boreal age.
D	Period of submergence and transgression of the Early Post-Glacial sea; Atlantic age.
C	Period of emergence; Boreal age.
B	Period of submergence and transgression of the Late-Glacial sea.
A	Last glaciation.

Beech appeared as the climate altered towards the end of the Sub-Boreal phase. To this phase can be assigned most of the Scottish mainland tree remains in inland lakes and exposed in the moors.

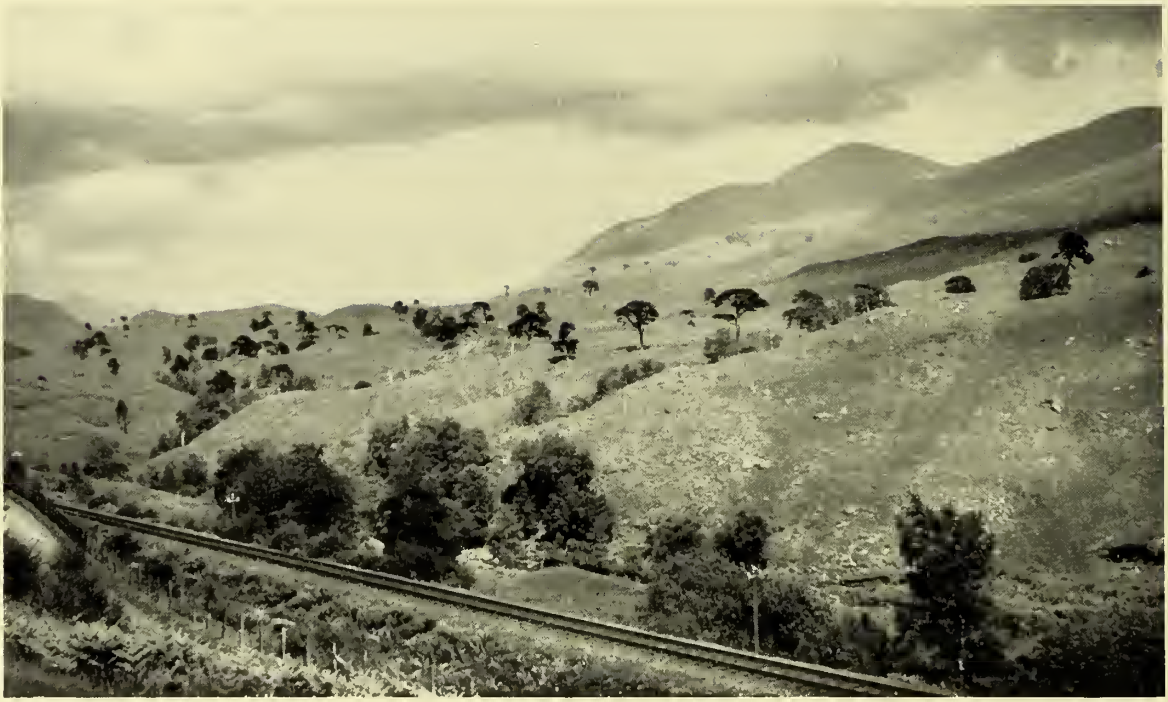
The drier and cooler conditions of the Sub-Boreal climatic phase induced the heaping up of wind-blown sand at wide, exposed parts of the Scottish coasts, locally upon the hardened Atlantic layer, and around and upon rocks studding the Early Post-Glacial raised beach. Great archaeological interest attaches to many of the dunes whose origin goes back so far, such, for example, as in an area along the mouth of an estuary (see particularly Chapter IX).

5. The Sub-Atlantic phase opened about 850 B.C. with a rapid change to cold and wet. It carries the history of our climate down to the present day. The decreasing warmth, damp, and oceanic conditions which have characterized it from the start have affected continental Europe less than Scandinavia and the more northerly and westerly parts of the British Isles. In these regions the phase has been marked throughout by the immense development of *Sphagnum* peat at the expense of the forests.

Hornbeam spread early in Sub-Atlantic times, and spruce (*Abies*) was added to the trees of Scandinavia, but the separation of Britain from the Continent prevented any widespread natural invasion of conifers into these islands. That conditions in Scotland since the beginning of the Sub-Atlantic climatic phase have been unfavourable also to the diffusion of broad-leaved trees is shown by the feeble pollen-content of the upper peat layers. It confirms that the country has not been heavily wooded for many centuries.

6. Man has from the beginning of historic times given his aid to the climatic factors responsible for the denudation of the country's woodlands. Indeed, so effectual has been the work of destruction that in Scotland the very term 'forest' has come to be used restrictively, and to denote the usually quite treeless and infertile sporting-ground of the deer-stalker. Yet, self-grown alders, birches, hazels, and small oaks today cover parts of the Southern Uplands. Together with rowans they clothe Highland straths and sheltered loch banks, dot the slopes of glens, and fringe the narrow hill burns. In the Outer Hebrides and on the rocky western mainland a few puny birches, dwarfed hazels, and stunted rowans cling in crannies; sallows grow on damp grounds in the West Highlands; and native pines, these 'Scots Firs' (*Pinus sylvestris* Linn.) which one always intimately connects

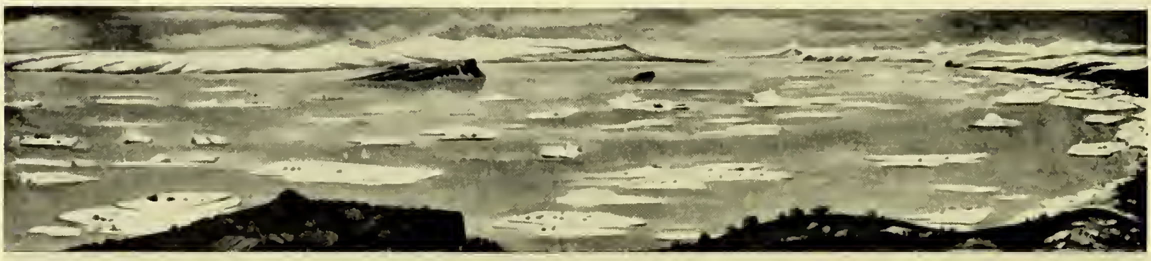
PLATE III



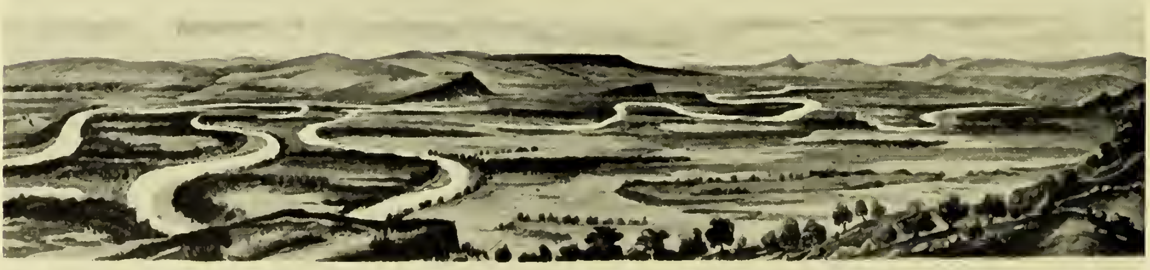
(*a*) VIEW IN GLENFALLOCH, PERTHSHIRE

Ben More in background; relics of deglaciation and native pines in centre; self-grown alders, birches, hazels, and oaks fringing stream in foreground.

(*From a photograph by J. Michieli, London.*)



LATE-GLACIAL



RECENT

(*b*) PANORAMAS FROM ABBEY CRAIG OPPOSITE STIRLING AT DIFFERENT PERIODS IN THE HISTORY OF THE FORTH

(*After Cadell, 1913.*)

Upper: The scene at the end of the Ice Age when the valley was submerged under the Late-Glacial sea.
Lower: The modern landscape after the sea had retreated to its present level.

with the idea of Scotland, here and there rear their gnarled and twisted trunks in some open, rocky, and formerly heavily glaciated regions in and beyond the Grampians (Pl. III *a*). These living reminders of the vanished forests of Scotland are quite distinct from the modern plantations.

4. STRATIGRAPHY

(*a*) *Nature of deposits.* The deposits which most clearly demonstrate the sequence from Ice Age conditions to Sub-Atlantic in Scotland have been revealed by cuts and bores in estuaries, along the coasts, and inland in peat-mosses and lake sites. Various Late-Glacial sediments rest upon the ground-moraine which records the last advance of the ice. They are overlaid by Post-Glacial beds. The presence or absence of one or other layer is of local significance only, and does not affect the established succession. Hence it is not difficult to link the principal and well-defined deposits over the country.

(*b*) *The estuaries.* Some of the old classic sections observed in the estuaries of the Clyde, Forth, Tay, and Ythan[1] are reproduced here with recent drawings and interpretations (Figs. 26, 27, 29, 32). The uniformity of the succession which they demonstrate is striking. (In the descriptions *A* refers to the last glaciation; *B* to the period of submergence and invasion of the land by the Late-Glacial sea; *C* to the subsequent period of emergence, and remains of Boreal age; *D* to the succeeding period of submergence and transgression of the Early Post-Glacial sea, and deposits of Atlantic age; *E* to the following period of land recovery, and beds of Sub-Boreal age; *F* to formations of Sub-Atlantic age.)

The Late-Glacial deposits resting upon boulder clay consist of clays, muds, and stratified sands and gravels laid down by the cold high-level sea. Here and there they are crumpled and contorted, presumably by the stranding of ice-rafts,[2] and contain great stones, some covered with acorn-shells (*Balani*) which were carried by floating ice. Up valley they pass into the river terraces. Upon them rest the Post-Glacial beds whose age has been determined by pollen-analysis.

The first important Post-Glacial bed overlying the Late-Glacial deposits in the estuaries is a tightly compressed peat containing the remains of hazel, willow, birch, pine, oak, and elm. The pollen-analysis of samples from Ochtertyre Moss in the Forth valley, above Stirling, and Forgandenny in the lower Tay basin, south of Perth, indicates that it is of full Boreal age.[1] Since this peat-bed passes under sea-level, it is part of the land-surface which, having been elevated after the transgression of the Late-Glacial sea, extended our coasts and united Britain and the Continent. It is the equivalent, therefore, of the late Pre-Boreal–Early Boreal moorlog of the Dogger Bank and other shoals now under the waters of the North Sea (p. 63, above). The land-surfaces in the northern peripheral region were submerged after the central and more southerly parts of the sea-floors. This difference in time permitted the migration of a number of warmth-loving trees from north to south. It explains the later pollen-spectrum for the shallow marginal peat-beds of Scotland and of north-western Germany.[2]

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[1] J. Geikie, 1894, pp. 183–4; Movius, 1942, pp. 290–2.

[2] J. Geikie, 1894, pp. 271–3.

Our Boreal layer can be equated with the submerged Early Post-Glacial forests and peat-beds which have been revealed at many points on the coasts of England, Wales, and Ireland, sometimes overlaid by series of deposits very similar to those in Scotland. Peat and vestiges of forests have also been noted between tide-marks and under sands at several places on the west, north-west, and east coasts of Scotland, in the Orkneys, Hebrides, Isle of Man, and on the English, Welsh, and Irish littoral.[3] They point to a lesser depression in certain regions than others.

Stoneless silty clay of varying thickness rests upon the Boreal peat in many estuaries. It was laid down during the transgression of the Early Post-Glacial sea which followed the emergence of the land. To it and the flats between Glasgow and Paisley the carse-lands of the Forth and Tay owe their fertility. So far this carse-clay has not yielded pollen, but it contains other indicators which show that the temperature rose and the climate improved during the main period of its deposition (below, p. 80). It can be assumed with confidence that this took place during the Atlantic climatic phase, for the estuarine clay of Scotland, resting upon the Boreal layer, is capped by a peat-bed determined by pollen-analysis to be of Sub-Boreal–Sub-Atlantic age, as at Forgandenny in the lower Tay basin and Ochtertyre Moss in the lower Forth basin.[4]

Besides the canoes from the estuarine deposits in the lower reaches of the Tay, Forth, and Clyde mentioned above (p. 66), a human dolichocephalic skull, of undetermined age, has been discovered at 21 feet from the surface at Grangemouth, Stirlingshire.[1] Other relics of man from the carse-clays in the Stirling district can, however, be assigned to their place in the archaeological sequence. The most remarkable are implements made in the antler of red deer (below, pp. 69–75).

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[1] Erdtman, 1928, pp. 181–3.

[2] Clark, 1936(*a*), pp. 36–37.

[3] J. Geikie, 1894, pp. 290–3; Reid, 1913, *passim*.

[4] Erdtman, 1928, p. 181.

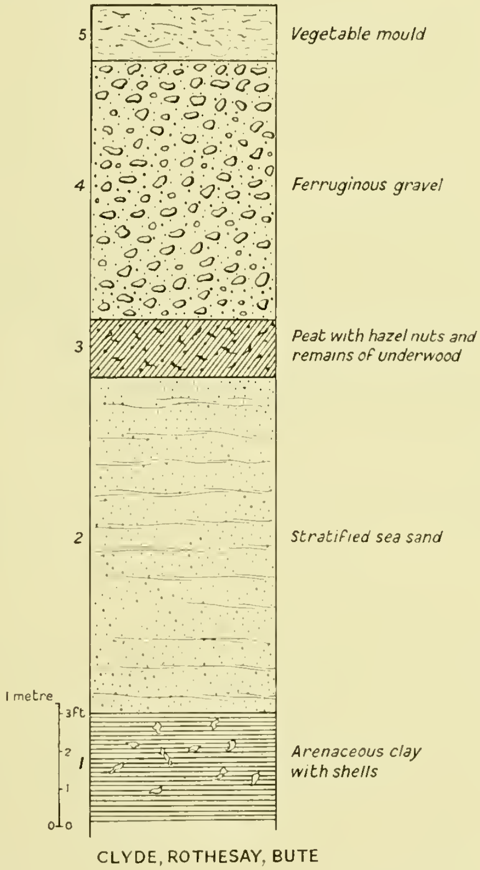

FIG. 27. Section at Rothesay, Bute. (Based on Miller's description, 1863.) (See Key, p. 69.)

5. Vegetable mould.
4. Ferruginous gravel; raised beach recording the transgression of the Early Post-Glacial sea, Atlantic age (*D*).
3. Peat with hazel-nuts and remains of underwood; attributable to period of emergence, Boreal age (*C*).
2. Stratified sea sand. } Attributable to the Late-
1. Arenaceous clay with shells. } Glacial sea (*B*).

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[1] J. Geikie, 1881, p. 402.

West of Stirling, in the extensive Kincardine Moss, the lower part of the Sub-Boreal–Sub-Atlantic peat contains tree-stools, including those of oak, the roots penetrating into the subjacent clay. Here a bronze cauldron of Late Bronze Age–Hallstatt (Early Iron Age) type[1] was found beneath the upper peat. The same formation in Blair Drummond Moss, nearer Stirling (Fig. 26, ii), has yielded a wooden mortar,[2] and has been observed to contain trunks bearing axe-marks and to overlie a roadway of felled logs.[3]

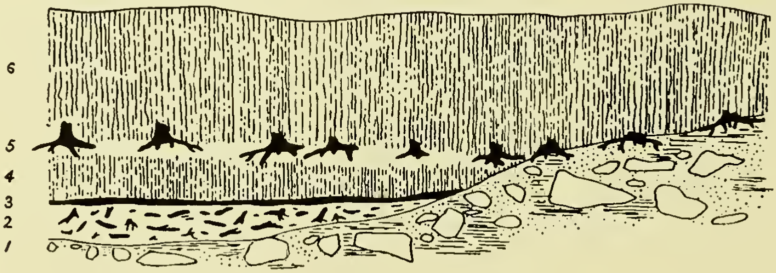

FIG. 28. Section in the Merrick-Kells Mosses, Kirkcudbrightshire. (After Lewis, 1911. By permission of the Royal Society of Edinburgh.) (See Key, p. 69.)

6. 'Recent peat', Sub-Boreal (*E*) in lower part, Sub-Atlantic (*F*) in upper.
5. 'Upper Forest', pine; Sub-Boreal (*E*).
4. Eriophorum peat. } Atlantic (*D*).
3. 'Second or Upper Arctic bed', sphagnum peat. }
2. 'Lower Forest', willow in the lower part, birch in the upper; passage from Sub-Arctic to Boreal (*B–C*).
1. Morainic material; last glaciation (*A*).

(*c*) *The Early Post-Glacial raised beach.* Few openings have been made in the Early Post-Glacial raised beach. Nevertheless, from its contained fossils and its relation to other deposits it is evident that this formation of gravels and sands is of the same age as the estuarine clays mentioned above. Peat has been found under the beach at Machrihanish, Kintyre, Argyll, but its pollen-statistics are as yet unpublished.[4] Containing fragments of rank underwood and hazel-nuts, it has been noted as resting below the gravels of this formation in the Firth of Clyde at Rothesay, Isle of Bute.[5] Fig. 27 has been drawn from the account which clearly records the succession. The peat-bed at these places is undoubtedly the counterpart of that beneath the equivalent raised beach in Northern Ireland, which is assignable to the Late Boreal–Early Atlantic transition, and therefore a portion of the

[1] Childe, 1945, pp. 158–9.
[2] Wilson, 1851, p. 34.
[3] Blackadder, 1824, p. 426.
[4] McCallien and Lacaille, 1941, p. 62.
[5] Miller, 1863, pp. 320–3.

ancient land-surface reclaimed from the sea during the emergence (pp. 51–53). At many places, however, the beach rests upon boulder clay or, where the coasts are most exposed, directly upon the rock. This is mainly because, during the Early Post-Glacial submergence of the land, the sea washed away some of the deposits laid down previously. Along more sheltered stretches the beach rests upon the sediments of the high-level arctic sea, which in turn overlie the boulder clay (e.g. Fig. 29).

Particularly at the head of estuaries, peat of great extent and thickness spreads over the Early Post-Glacial raised beach or its equivalent clays and silts. Locally two layers have been distinguished, and samples from Wigtownshire (above, Fig. 25) and Dumfriesshire have been analysed for their pollen-content. The lower, much mouldered and containing remains of trees, gives a Sub-Boreal reading; the upper, a *Sphagnum* formation only slightly mouldered, a Sub-Atlantic spectrum.[1] At several points on the coast, including Shewalton Moor, Ayrshire, an accumulation of peat has been observed resting on sand on top of the beach proper. In Ardgour and Lochaber this peat is formed of moorland plants, and the underlying sand contains drifted pieces of oak without roots.[2]

From the above it appears that in Scotland, as in Northern Ireland, the making of the raised beach, like the laying down of the estuarine clays, probably extended into the Late Atlantic climatic phase. Unfortunately, these deposits of such importance to Scottish archaeology have not been studied with the thoroughness expended on their counterparts in Northern Ireland. The results obtained there provide many standards for comparison and correlation. They suggest also what may be achieved by the collaboration of scientists on this side of the North Channel. Yet even now it is satisfactory to find that independent deductions in Scotland agree with one another so closely that, taken with the data from Ulster, they afford bases for the examination of the archaeological evidence to be considered later.

(*d*) *Upland peat-mosses.* Pollen-analysis indicates that the climatic changes recorded in Scottish upland peat-mosses agree with those established in the estuaries and on the seaboard.[3] The most comprehensive sections have been noted in the south of Scotland (Fig. 28). Here sub-arctic, alpine, and

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[1] Erdtman, 1928, pp. 173–6.

[2] Lewis, 1911, pp. 813–15. It is interesting to find in these localities that an identical, and presumably contemporary, peat rests upon the remains of trees, including oak, rooted in the 50-foot beach which registers a stage in the fall of the Late-Glacial sea.

[3] Erdtman, 1928, pp. 177–81, 183–7.

Pre-Boreal plant remains resting upon morainic material denote the gradual passage from the last period of intense cold. They are overlaid by vestiges of the Boreal forest. These in turn are covered by peat assignable partly to the Late Boreal, but mainly to the moister conditions promoted by the extensive development of the sea during the Atlantic climatic phase. Traces of a poor flora including tree-stools rooted in the Atlantic layer indicate the renewal of forest growth during the Sub-Boreal phase. The whole is sealed by peat, Sub-Boreal in its lower part and Sub-Atlantic in the upper. In the north of Scotland generally, and in all the islands, the Boreal forest only is represented, and the heavy overburden of peat is extremely poor in pollen.

(*e*) *Peat-filled lakes.* Peat-filled lakes provide good evidence of the climatic sequence from Ice Age to Post-Glacial. In the Midland Valley, particularly in Angus, these have long been known to afford the most complete record. They include intercalated marls or detritus-beds which have yielded mammalian remains, vestiges of trees and smaller plants, and clays. Recently the critical methods of pollen-analysis have been used to determine the age of the different sediments.[1] Samples from White Loch Moss, near Dunning, Perthshire, indicate that the detritus-bed, in which birch is dominant, is of Boreal age and rests upon a Pre-Boreal layer poor in pollen. At Loch Kinnordy, Angus, the equivalent bed or marl, underlying what is probably an Atlantic–Sub-Boreal detritus-bed, is believed by analogy with Irish marls to be of pre-Atlantic age. A section noted long ago in Whitrig Bog, Roxburghshire,[2] a favoured locality even early during the retreat of the New Drift ice,[3] revealed a series of deposits similar to those of some Irish bogs.[4]

(*f*) Table III (p. 77) embodies an attempt to interpret the principal deductions of our pioneer investigators. Columns A and B give these deductions in the terms of climatic phases used in current chronology, based on the modern technique of pollen-analysis shown in column C. The approximate dates of the geochronological (varve) scale appear in column D. Table IV (p. 78) shows how the climatic developments synchronized with the late periods of the deglaciation and the attendant land movements.[5]

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[1] Erdtman, 1928, p. 183.

[2] J. A. Smith, 1872, pp. 297–9.

[3] Charlesworth, 1926 (*b*), pp. 49–50.

[4] Mitchell, 1940; 1948.

[5] An interesting study of the bottom deposits of Windermere (Pennington, 1943), having special reference to the diatom succession, has revealed a climatic record of sedimentation undisturbed by sub-aerial erosion and agreeing with the order set forth above. Close research on the same lines in the open glacial lakes of Scotland would doubtless prove as illuminating.

TABLE III

The Post-Glacial sequence, in terms of plant-beds, epochs, climatic phases, and geochronology.

A	B		C	D
TERMINOLOGY OF LEWIS (1905, 1906, 1907, 1911)	EPOCHS OF J. GEIKIE (1914, pp. 278–81)		CLIMATIC PHASES Erdtman (1928); Sernander (1908)	GEOCHRONOLOGY Approx. years B.C. De Geer (1928)
Recent peat	Recent and Present		Sub-Atlantic	850
Forest	Upper Forestian		Sub-Boreal	2500
Peat bog plants with Arctic plants				
Forest				
Peat bog plants	Upper Peat Bog	Lower Turbarian	Atlantic	5000
Arctic plant bed	Second Arctic Bed			
Peat bog plants	Lower Peat Bog			
Forest	Lower Forestian		Boreal	6800
Arctic plant bed	First Arctic Bed		Pre-Boreal	7800

TABLE IV

Late-Glacial and Early Post-Glacial chronology in Britain and the Baltic area.

Approx. years B.C.	BRITAIN		BALTIC		Climatic phases
	Retreat of the ice	Land and sea	Retreat of the ice	Water bodies	
	POST-GLACIAL	EMERGENCE (Present sea)	POST-GLACIAL	BALTIC SEA	SUB-BOREAL
2500		SUBMERGENCE Drowning of land-connexions; Britain separated from the Continent; transgression of the coasts of Scotland, etc.; formation of raised beach up to nearly 50 ft. in Scotland.		LITORINA SEA	ATLANTIC
5000		EMERGENCE Britain united to the Continent; partial land-bridges between Britain and Ireland.		ANCYLUS LAKE	BOREAL
6800					PRE-BOREAL
7300	THIRD PERIOD	SUBMERGENCE Late-Glacial high-level sea recorded by strand-line, etc., up to about 155 ft. in Scotland.	FINI-GLACIAL	YOLDIA SEA	
7800	SECOND PERIOD		GOTI-GLACIAL	ICE-DAMMED LAKE	

5. THE FAUNA

(*a*) *Significance of remains.* In some parts of Scotland animal remains are the only pointers to once prevailing climatic conditions and to the age of deposits. As a rule, however, the converse is the case, for it is the age of the animal remains which is indicated by the containing deposits, principally the estuarine and littoral formations mentioned in the preceding pages.

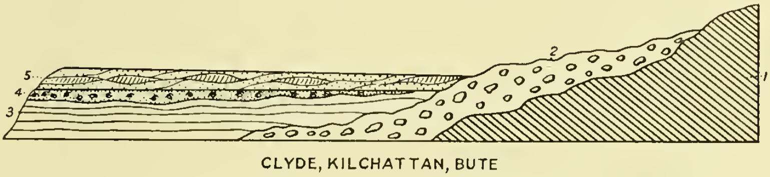

FIG. 29. Section at Kilchattan, Bute. (Redrawn from Jamieson, 1865.) (See Key, p. 69.)

5. Gravel and shingle; raised beach recording the transgression of the Early Post-Glacial sea (*D*).
4. Shell-bed; recovery of the land well advanced (*B* passing to *C*).
3. Fine laminated clay; Late-Glacial sea (*B*).
2. Boulder earth; last glaciation (*A*).
1. Bed-rock (sandstone).

(*b*) *Marine molluscs.* Because of the well-known sensitivity of molluscs to changes of temperature, especially near the limits of their distribution, the remains of the marine invertebrate fauna are useful indicators of past climatic conditions. That this is particularly true of northern regions is demonstrated by shells found in Scotland.

Molluscs abounded on the shores of the Late-Glacial sea, at any rate during its decline and in the more southerly areas of its transgression. *Chlamys* [*Pecten*] *islandica* (Müller), *Astarte borealis* (L.), *Astarte montagui* (Dillwyn), and *Macoma* [*Tellina*] *calcarea* (Gmelin)[1] are among the many characteristic forms identified in the clays and muds laid down by the high-level sea in the distended estuaries and along the coasts. They have been reported from the lower reaches of the larger rivers and points along the east coast from Peterhead to the Firth of Forth.[2] In this estuary they occur even above Stirling, and in the lower Tay between Dundee and Perth. Around Paisley and Glasgow the deeper water deposits of the cold sea have yielded great numbers. Many are recorded from equivalent beds farther down the Firth of Clyde, as at Rothesay in the Isle of Bute,[1] and elsewhere in the central western kyles and sea-lochs as far north as Benderloch, Argyll.[2] Another exposure in Bute, at Kilchattan Bay (Fig. 29), deserves special mention.[3] It revealed a shell-bed under the well-developed Early Post-Glacial raised beach. The fossiliferous stratum, though containing forms more northern than today inhabit the shores of Bute, seems to be referable to the time when the land had risen well out of the Late-Glacial sea, the deposits of which it was observed to overlie. Clay beds and moraines contain specimens which supplement other proofs of the occupation of the Loch Lomond fjord by the Late-Glacial sea (p. 43, above).

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[1] Macgregor and MacGregor, 1936, p. 82.

[2] Jamieson, 1865, pp. 181 ff.

As the temperature rose to the Post-Glacial optimum the more northern types of molluscs gave place to southern forms; and the more adaptable species, reacting to the improving conditions, increased in number and size. These later groups are abundantly represented by fossils in the Scottish estuarine beds and raised beach deposits (Fig. 30) laid down during the Atlantic climatic phase. They are predominantly of molluscs still living on our shores, and typical of the assemblage after which the Litorina Sea in the Baltic trough has been named. Among them are included the remains of such forms as *Scrobicularia piperata* (Gmelin) occurring in the carse-clays and *Cylichna obtusa* (Montg.) in the raised beach, which point to conditions at least as warm as the present. These have been recorded from as far north respectively as Loch Spynie near Elgin, and the mouth of the Ythan north of Aberdeen.[4] After the climatic optimum some northern forms such as *Cyprina* [*Arctica*] *islandica* (Linn.) reappeared.[5]

(*c*) *The marine vertebrate fauna.* Remains of vertebrates from the deposits of the Late-Glacial sea are scanty. Their distribution, however, is interesting in relation to the present sea and because it testifies to the extent of the Late-Glacial marine transgression (map, Fig. 31). They have been found mainly in the basins of the greater estuaries, particularly the more southerly. In these areas invaded by the arctic sea the fossiliferous beds are certainly later than the last glacial episode in central Scotland, since locally they rest upon boulder clay (Fig. 32) and lap round kames and eskers.[6]

(*d*) *Fishes.* Fishes lived in the Late-Glacial sea, but owing to their perishable nature, few fish-bones have been recovered. They have, how-

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[1] Miller, 1863, pp. 320–3; Fig. 27 and pp. 73–74, above.

[2] Wright, 1937, p. 369.

[3] Jamieson, 1865, pp. 173–4.

[4] Ibid., p. 203.

[5] Movius, 1942, p. 181.

[6] J. Geikie, 1894, p. 273.

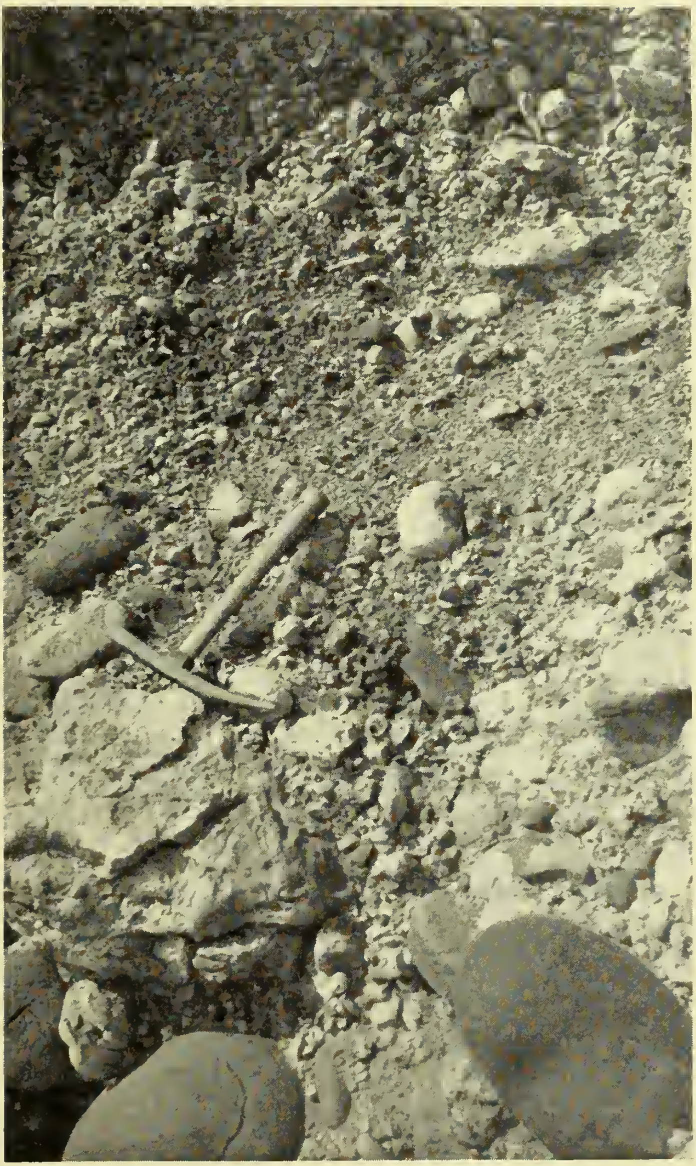

FIG. 30. Shell-containing shingle of the Early Post-Glacial raised beach at Milton Ness, St. Cyrus, Kincardineshire.

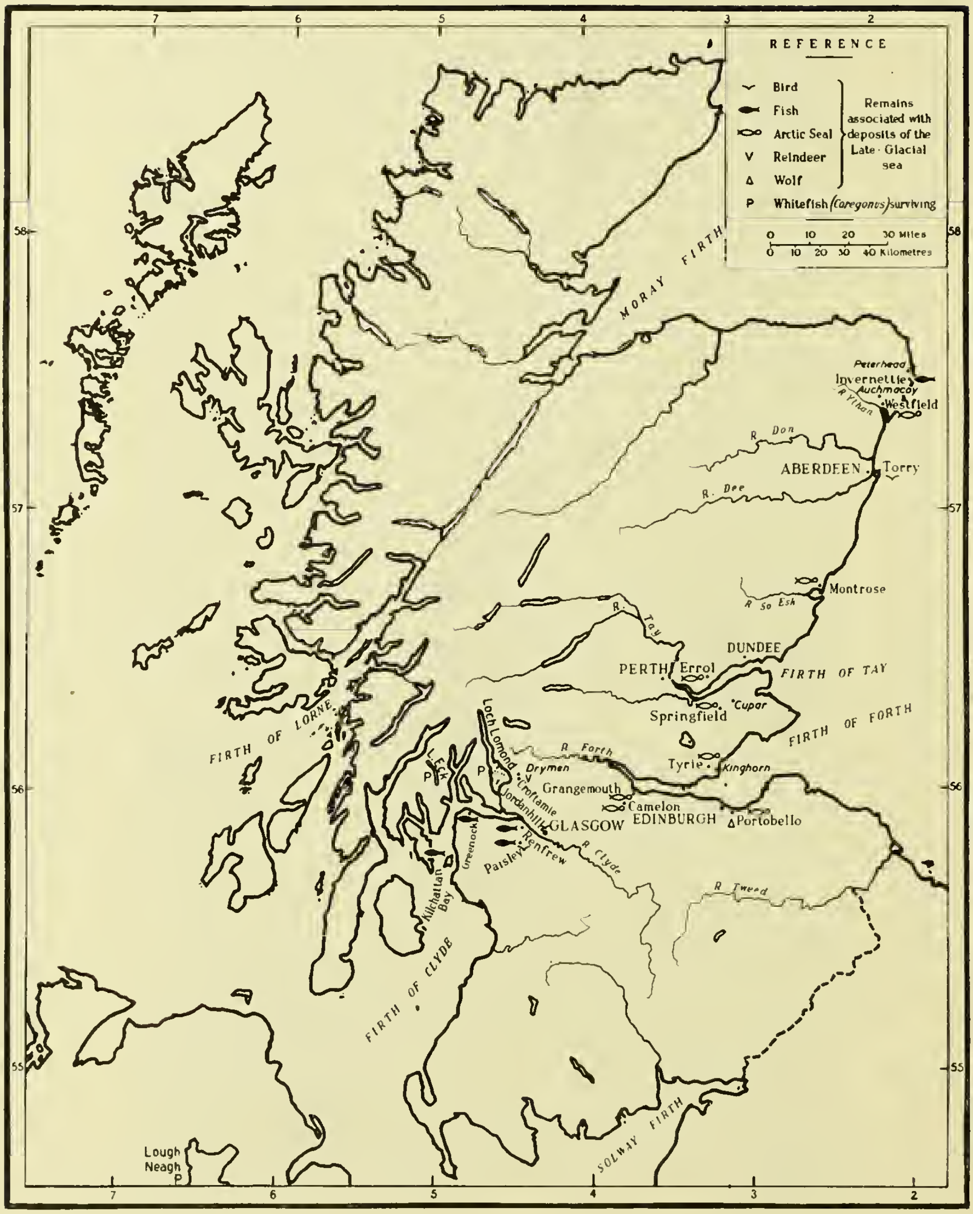

Fig. 31. Map showing the distribution of vertebrate remains found in association with deposits of the Late-Glacial sea.

ever, been recorded from Invernettie, near Peterhead in the north-east,[1] from Loch Gilp, Argyll, from Renfrew, Paisley, and Greenock in central Scotland,[2] and Kilchattan Bay, Bute, in the south-west.[3]

It is thought that some 'white-fish' resembling species now migratory in arctic regions tenanted the Loch Lomond and Loch Eck fjords, and gradually adapted themselves to freshwater habits as the uplift of the land and resulting restriction of outlets converted these arms of the Late-Glacial sea into lakes. They would be represented today by an aberrant member of the Salmonidae, the powan (*Coregonus clupeoides* Lacépède) of these two lochs (Fig. 33).[4] (Cf. the pollan of Lough Neagh and other Irish inland waters that had been accessible to the flows of the Late-Glacial sea.)

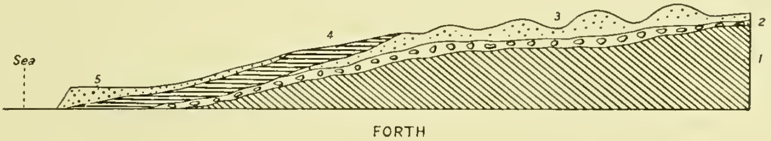

FIG. 32. Section in the Forth Estuary, showing the relation of the kames to the underlying and overlying deposits. (Redrawn from J. Geikie, 1894.) (See Key, p. 69.)

5. Recent beach deposits; attributable to the Early Post-Glacial sea (*D*, &c.).
4. Brick-clay, &c.; attributable to the Late-Glacial sea (*B*).
3. Kames series; retreat of the ice.
2. Boulder clay; last glaciation (*A*).
1. Bed-rock.

The food-refuse of longshore settlers on top of the Early Post-Glacial raised beach and in caves behind this formation indicates the variety, not only of molluscs, but also of fishes in the coastal waters. It may be inferred, therefore, that long before the arrival of these people the rivers and lakes also teemed with life.

(*e*) *Birds*. Evidences of bird life in Scotland between the New Drift Glaciation and the Early Post-Glacial period are furnished by the deposits of the Late-Glacial sea. They consist of the furcula of a gull (diver) and other bird-bones from around Paisley,[5] bones from a brickclay-pit at

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[1] Jamieson, 1858, pp. 518–19.

[2] Crosskey and Robertson, 1871 (*a*), p. 121; 1871 (*b*), pp. 332, 338; 1874, p. 41.

[3] Robertson and Crosskey, 1874 (*a*), p. 131.

[4] Lamond, 1931, pp. 24, 91–94.

[5] J. Smith, 1862, p. 14.

Jordanhill, Glasgow,[1] and the skeleton of a duck from Torry on the south bank of the Dee opposite Aberdeen.[2]

Since the bones of birds are usually small, they are generally as imperfectly preserved in land deposits as in marine. Consequently their identification is somewhat uncertain, but the remains of ptarmigan (*Lagopus mutus* Montin) from the lower and upper layers in the cave at Inchnadamph leave no room for doubt.[3] This bird must have been an early forerunner of the abundant avifauna which reached and spread in Scotland as the climate became milder. Some species have since deserted the Lowlands, and man has exterminated others, including the garefowl or great auk (*Alca impennis* Linn.) of the northern seas (Fig. 34). Its southern range in Scotland, embracing the islands and shores of the mainland of Argyll, is known largely from bones identified among those of many birds in the refuse-heaps of strand-loopers.

FIG. 33. A Loch Lomond powan, ½ lb., 12 in. long. (From a water-colour sketch by H. Lamond, 1931.)

(*f*) *Marine mammals.* Of the skeletal remains from the marine clays, those of the arctic seal (*Pagomys foetidus* Gray) clearly reflect conditions along the margins of the cold sea. They have been found along the east coast at several places (map, Fig. 31), even quite distant from the present coast-line, from the lower Ythan, at Westfield of Auchmacoy, Logie-Buchan near Aberdeen, to Portobello in Midlothian.[4] The most outstanding come from Errol between Dundee and Perth in the Tay estuary; Springfield, Fife, ten miles up the Eden valley; Tyrie, half a mile inland from Kinghorn, Fife; Grangemouth and Camelon, Stirlingshire, the latter almost four miles from the nearest point on the Forth.

Bones point to an increase of marine mammals in the coastal seas of

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[1] Robertson and Crosskey, 1874 (*b*), p. 244.

[2] Jamieson, 1858, pp. 509–10.

[3] B. N. Peach and Horne, 1917, p. 347.

[4] J. Geikie, 1874, pp. 558–9.

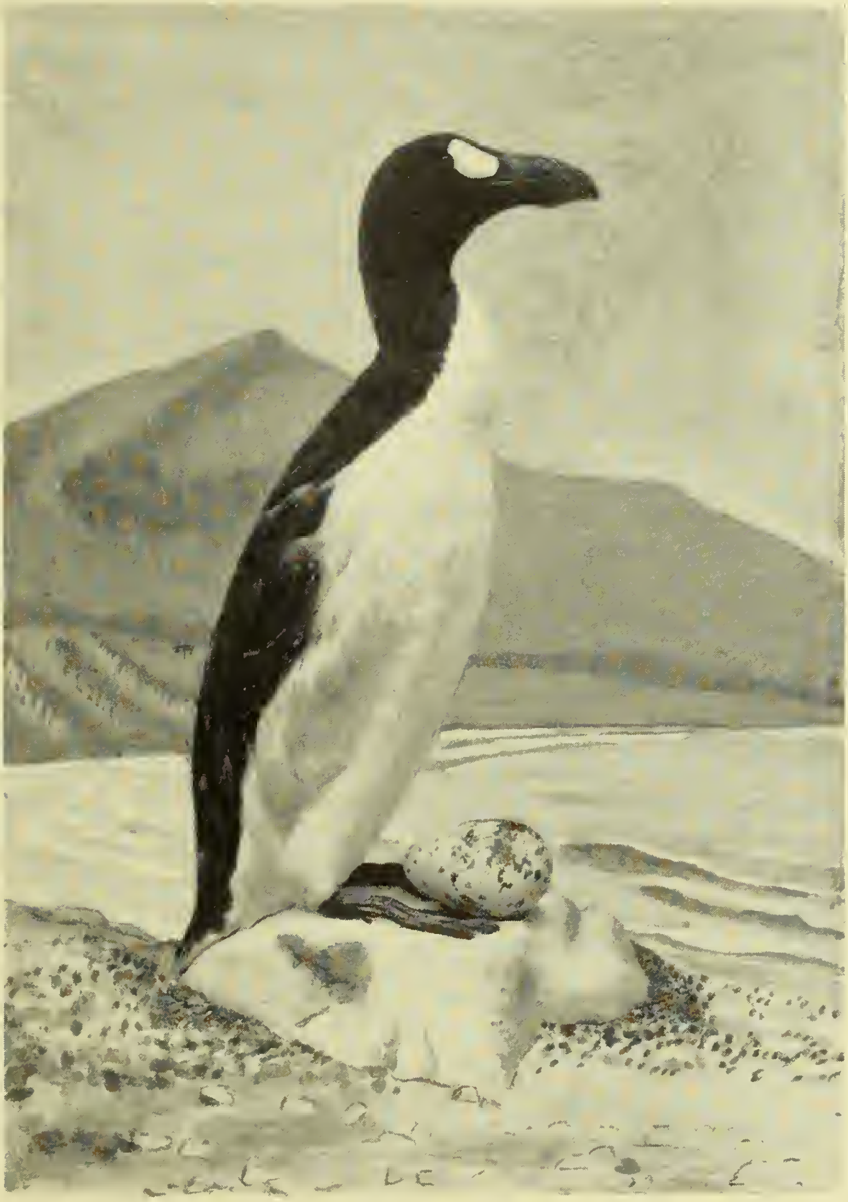

FIG. 34. Garefowl or great auk, with its solitary egg (approx. $\frac{1}{6}$ natural size). (Based on photograph by the Royal Scottish Museum.)

Scotland under the improving Early Post-Glacial climate. Many adduce the considerable extent of the marine invasion which is correlated with the Litorina Sea of the Baltic region. These bones are of seals and whales found deep down in the carse-clay of the Forth, some with the artifacts of man. The most remarkable have been reported from Bridge of Allan[1] and Blair Drummond.[2] At Campbeltown, Argyll, the deposits of the Early Post-Glacial raised beach have yielded remains of grey seal (*Halichoerus gryphus* Nils.).[3] This species, with common seal (*Phoca vitulina* Linn.) and rorqual (*Balaena physalus* Linn.), is represented also in kitchen-middens resting upon this formation in islands in the same county.

(*g*) *Land mammals*. A few of the highest mountains in the south of Scotland may have reared their tops above the ice-sheets of the New Drift. Apart from this possibility there were no nunatak areas in Scotland. Hence it seems out of the question that any land animals, which had reached Scotland during the preceding period of climatic improvement, could have survived the great readvance of the ice. It was otherwise in Ireland, the southern part of which was spared by the concomitant glaciation. Many members of the late Pleistocene fauna, which had spread widely in Ireland during the congenial spell before the New Drift, retreated there and outlived the glaciation. Some forms, including the pachyderms, eventually died out in the refuge areas outside the limits of the New Drift and its associated advances in the British Isles. Again, some animals adapted themselves to the changing environment due to climatic improvement and the development of vegetation.

The evidence of early mammalian northward migrations during the deglaciation of the British mainland is meagre indeed. So far, nothing suggests that warm-blooded land forms reached Scotland until the Second Period of Retreat. The earliest records of these movements after the New Drift Glaciation are from the English north country, the most interesting being from the Victoria Cave, Settle, west Yorks. They consist of artifacts of Magdalenian type made in reindeer antler by man in the Creswellian (English Upper Palaeolithic) stage of cultural development.[4] Cave-earth containing glacial erratics, carried presumably by a concomitant of the Scottish Readvance, in Dog Hole Cave, Warton Crag, near Carnforth, north Lancs, farther north-west, has yielded the bones of reindeer, urus

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[1] Haswell, 1866.

[2] Blackadder, 1824, p. 441.

[3] Gray, 1894, p. 272.

[4] Garrod, 1926, p. 120.

(or aurochs), giant deer, common or arctic lemming, northern and Siberian voles.[1] These remains probably represent an extension of animal movements northward beyond Settle during the First Period of Retreat when plants grew in Cumberland.[2]

The land animals which reached Scotland as the climate improved and as the vegetation developed are known from bones found in various deposits, mostly in the Midland Valley and in caves in the Highlands. Engineering and commercial excavations, the digging for marl and peat in ancient lakes and mosses, and the dredging of rivers have all contributed. Yet, from the different circumstances of discovery, and because of the variety of species represented, the exact order of distribution is not clearly defined. This can be explained partly by the fact that the northern sea must have cut off the advance of the arctic and steppe animals, and caused them to become mixed with forms which normally lived under different conditions.[3] However difficult it may be, therefore, to demonstrate the sequence, it is certain that the mountainous north-west and west for long afforded habitats appropriate to the last survivors of the arctic fauna.

The age of a portion of antler found with marine shells in a glacial deposit at Croftamie, Dunbartonshire, near Drymen[4] has long been disputed. It seems, however, that the fragment can now be assigned to a phase of the Second Period of Retreat, which may have corresponded to the Allerød Oscillation in the Götiglacial Period in the Baltic area. It would point to the presence of reindeer near Loch Lomond when it was an arm of the Late-Glacial sea inhabited by characteristic arctic molluscs, before the readvance of the glacier down the fjord.[5] By the time the ice had almost disappeared from the Midland Valley, about the end of the same period of retreat from the line of the Lammermuir–Stranraer Moraine,[6] a few hardy animals had reached the Forth basin, but none apparently crossed the swollen and ice-laden river. An important group from Green Craig in the Pentland Hills was found to include remains of wolf and horse besides reindeer. It has been referred to this stage of retreat.[7] At Corstorphine, near Edinburgh, deposits overlaid by the outwash gravels and sands of the melting Forth glacier in a silted-up glacial lake have yielded bones of the giant fallow deer (*Megaceros hibernicus* Owen), so frequently miscalled the Irish elk, and arctic lemming (*Dicrostonyx torquatus* Pall.), associated with the vestiges of plants still living within the Arctic Circle. These included dwarf birch (*Betula nana* Linn.), willows (*Salix polaris* Linn., *S. herbacea* Linn., *S. reticulata* Linn.), *Oxyria digyna* Hill, and the phyllopod crustacean *Lepidurus* (= *Apus*) *glacialis* Krøyer.[1] This assemblage indicates a climate earlier than Pre-Boreal, its species being identical with those which established themselves in the wake of the retreating ice while the Yoldia Sea still occupied the Baltic trough.[2]

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[1] Jackson, 1909, 1911, and 1913.

[2] Eastwood, Dixon, Hollingsworth, and B. Smith, pp. 244–5; above, pp. 30, 33.

[3] Ritchie, 1920, pp. 12–13.

[4] J. A. Smith, 1857; Jack, 1876.

[5] Simpson, 1933, pp. 641–3.

[6] D. Tait, 1934, pp. 110–13.

[7] J. Geikie, 1894, pp. 304 ff.

To the east, at Portobello, the jawbone of a wolf was found embedded in clay laid down by the Late-Glacial sea,[3] or in the same conditions as the remains of the arctic seal (p. 84, above). All these animal remains indicate that the stocking of Scotland began in Late-Glacial times, and the character of the land forms represented indicates the resumption of the northward push of the fauna after its halt in the north of England, presumably by the Scottish Readvance which closed the First Period of Retreat.

The cave bear (*Ursus spelaeus* Blum.), and such characteristic cold forms as the arctic fox (*Canis lagopus* Linn.) and northern vole (*Arvicola* or *Microtus ratticeps* Keys and Blas.), are known only from the lower beds in caves in the valley of the Allt nan Uamh near Inchnadamph in Assynt. Their bones have been found in association with those of other hardy animals, including arctic lemming. Since the last has also been recorded near Edinburgh, it is safe to conclude that all the arctic creatures represented in the north-west were early arrivals in the south of Scotland.

As the vegetation developed and the forests spread under the rising temperature, animals in increasing numbers gained Scotland from the south, some possibly from the Continent and Ireland across the uplifted sea-floors and partial land-bridges. By its reduction of the estuaries and extension of the coastal grounds, the Early Post-Glacial emergence of the land would facilitate and encourage faunal migrations beyond the Forth, to and in the west. Because of their interest, further attention may be paid to some of the animals referred to above, and to outstanding members of the rich fauna which early became established in Scotland during the Post-Glacial period.[1]

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[1] B. N. Peach and Horne, 1917, p. 342.

[2] Wright, 1937, p. 439.

[3] D. Tait, 1930, p. 319.

The reindeer offers a most remarkable picture of the adaptation of a form, regarded as essentially cold-resisting, to the geographic, climatic, and vegetational changes which succeeded the Ice Age in Scotland. In space and time it had an extensive range. As shown by the distribution of its remains, this animal found a congenial environment in the south and south-west and many parts of the North Sea basin as far as the Orkneys. It eventually developed into a woodland race, which probably persisted long, though it is quite unlikely that it endured until the twelfth century of this era, as has been suggested. The giant fallow deer, the largest of the early migrants into the territory vacated by the New Drift ice, did not become as common in Scotland as in Ireland. It seems to have been confined to the region south of the Forth, and to have disappeared soon after the beginning of the Early Post-Glacial period. On the other hand, its congener, the elk (*Alces machlis* Ogilby), roamed over the flatter parts of the land from Wigtownshire to northern Sutherland and endured longer. Its remains, like those of the giant fallow deer, have been recorded mainly from marl-beds underlying peat, as at Whitrig Bog (above, p. 76). Among other Early Post-Glacial immigrant cervids, the red deer (*Cervus elaphus* Linn.), a much larger creature than its protected descendant of restricted range, spread everywhere, even reaching the Orkneys, Shetlands, and Hebrides. Its antler was used extensively by early settlers for the manufacture of implements, such as have been found in the estuarine deposits of the Forth, in kitchen-middens, and in occupation-refuse in caves connected with the Early Post-Glacial raised beach.

Cowdon Glen, Renfrewshire, is to be credited with the few bones of the wild horse (*Equus caballus ferus* Nel.) found stratified in Scotland. Their Early Post-Glacial age is indicated by the character of the associated plants and animal remains, among which those of another steppe form, the great ox or urus (*Bos primigenius* Boj.), are outstanding. This beast became distributed over southern Scotland and in the plains of the North Sea basin as far as Caithness. It gradually declined from the time of the formation of the peat-mosses, but is thought nevertheless to have survived into the tenth century.

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[1] The following paragraphs dealing with land mammals are based largely on Professor J. Ritchie's work (1920).

The introduction of another form associated with woods and water is demonstrated by the remains of the beaver (*Castor fiber* Linn.). Common from the Solway to Perthshire, this rodent may have persisted quite late in the heart of the Highlands.

The wild boar (*Sus scrofa ferus* Linn.) was also an Early Post-Glacial addition to the fauna of Scotland. Becoming widespread in the eastern part of the country, it gained the west and even some islands, but it eventually degenerated by domestication and lost its distinctiveness.

Of the larger beasts of prey, the wolf, which was one of the earliest arrivals, had the widest distribution and persisted longest. Until about the tenth century of this era it was associated with the brown bear (*Ursus arctos* Linn.), which it outlasted by several hundred years. The former presence of another carnivore is shown by the bones of lynx (*Lynx lynx* Linn.), but only from the upper layer of a cave near Inchnadamph.

Great interest attaches to the variable hare (*Lepus variabilis* Linn. *var. scoticus?* Newton),[1] the remains of which are numerous in the cave at Inchnadamph in Assynt. The colour-changes of this animal in autumn and spring recall its past associations, and indicate that among the smaller mammals this particular form must rank as an early immigrant.

Not long after the stocking of Scotland was completed during the Boreal climatic phase, there occurred the land-sinking and marine invasion which are equated with the transgression of the Litorina and Tapes Seas. Since the mainland of Britain was thereby cut off from the Continent and its communications with Ireland and other islands were severed, further natural introductions were confined to the accidental dispersal of certain plants and birds. The later additions of domesticated forms do not concern this study.

(*h*) *Man.* As shown by artifacts from dated deposits, it was towards the end of the Early Post-Glacial emergence of the land and beginning of the subsequent transgression of the sea that man first settled in Scotland. It remains to be considered how he reached that land of game-abounding fens, hazel scrubs and developing forests, fish-stocked rivers and lakes, generous shores and coastal waters.

A pictorial idea[2] of how conditions then differed from those prevailing in Late-Glacial times has been given in a classic work on the River Forth.[1] Reproduced here as Pl. III *b*, this serves to amplify the descriptions and illustrations in this chapter, which show the sequence from the last glaciation to the Early Post-Glacial period.

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[1] B. N. Peach and Horne, 1917, p. 345.

[2] The upper component of Pl. III *b*, representing the Forth valley during the invasion of the Late-Glacial sea, suffices to dispel any notion that man might have inhabited the country

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while such conditions reigned. The futility therefore of searching for his relics in deposits associated with the high-level arctic sea must be self-evident.

[1] Cadell, 1913, pl. facing p. 116.

IV

MESOLITHIC CULTURE SUPERSEDES THE DECLINING UPPER PALAEOLITHIC

1. INTRODUCTION

FOR untold centuries the Palaeolithic peoples, though widely distributed, had been separated by the ice-sheets into isolated regional groups. It has been possible, therefore, to assign their various cultural developments to fairly well-defined periods. The history of man on the Continent during and after the deglaciation, however, becomes more complicated. As the climate became milder, and a new flora and fauna gradually replaced the plants and animals of the Ice Age, so tribal movements took place and races mingled. Cultures faded out, or came into contact and blended. Thus Upper or Late Palaeolithic equipments were modified to suit man's changing environment. These developments were by no means everywhere the same or contemporary.

By comparison, the history of man in Britain is simpler. The relatively small area, within which a few tiny communities were confined during the earlier periods of deglaciation, had become detached from the Continent and ceased to be an extension of the northern French cultural province. No important exotic elements, therefore, were added to man's Upper Palaeolithic equipment in Britain until connexions were restored by the emergence of the sea-floors during the Boreal climatic phase. By then the Pleistocene epoch had drawn to a close, the Palaeolithic Age had ended, and under an improving climate a richer vegetation and a temperate fauna were spreading. The Holocene (or Recent) epoch of the geologist had opened in the British Isles, and the Mesolithic Age of the archaeologist had begun.

The term *Mesolithic*, or Middle Stone Age, does not so much connote a period of transition as one of survivals of ancient traditions, between the end of the Palaeolithic Age and the coming of food-producing people with their new arts. It embraces several cultures, now recognized to have existed during what was formerly thought to have been a hiatus separating the Palaeolithic from the Neolithic. The exponents of these Mesolithic cultures continued the food-collecting ways of their Old Stone Age forerunners.

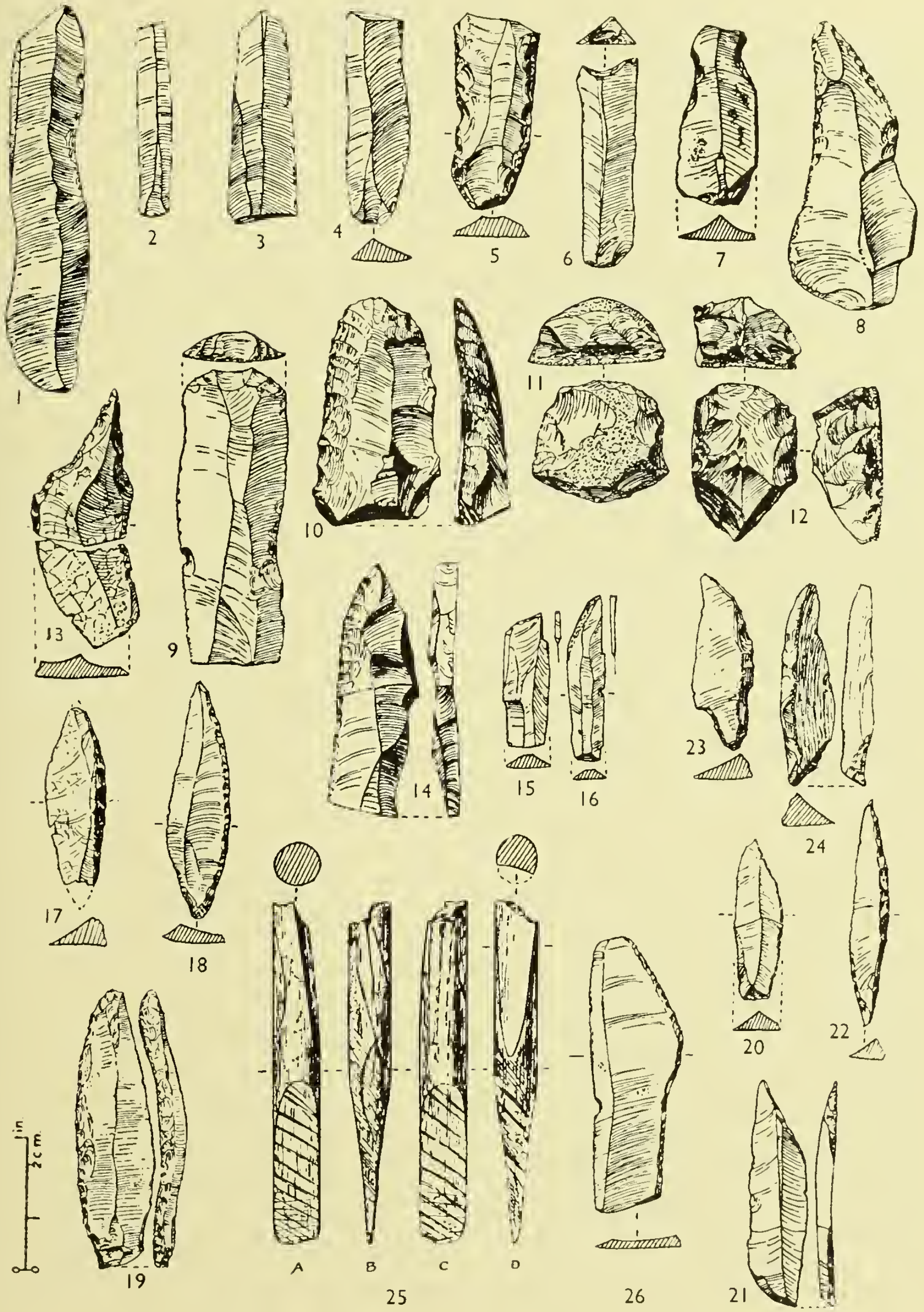

Fig. 35. Selection of Creswellian (Upper Palaeolithic) types from the Basal Zone in Mother Grundy's Parlour, Creswell Crags, Derbyshire. (After Armstrong, 1925.) Flint, except no. 25, which is bone.

Hence the break with the past occurred at the end and not at the beginning of this period.

2. THE LATE UPPER PALAEOLITHIC (CRESWELLIAN) OF ENGLAND

Owing to the re-establishment of land-connexions (see map, Fig. 20) the influences of some continental Mesolithic cultures converged upon Britain. Here the native Upper Palaeolithic Creswellian had developed on elements of the Aurignacian complex, mainly late and of La Gravette facies evolved on Châtelperron types (Fig. 35). It had been but feebly reinforced by Proto-Solutrean increments. To these may have been added in time a few ingredients of the Continental Magdalenian, contemporaneously with which the Creswellian flowered and ran to seed. The forms suggestive of possible links with the Magdalenian occur, not so much in the Creswell Crags, the type-locality of the English Upper Palaeolithic, as at Kent's Cavern, Torquay, in the shape of bilaterally barbed points made in reindeer antler.[1] To the Creswell Crags, however, we turn for indications of later and crucial blendings. Deposits in classic rock-shelters here, besides providing data for the tentative linking of British and Continental late Pleistocene events, record a continuity of occupation from Middle Palaeolithic to Mesolithic.[2]

3. MESOLITHIC STRAINS FROM THE CONTINENT

The cultures, which were evolved on the Continent in response to the changing conditions brought about by the melting of the ice, have been admirably studied by British scholars. It is only necessary, therefore, to outline here what has been described in detail and summarized in readily accessible works.[3] Stress, however, has to be laid on the Continental post-Upper Palaeolithic cultures which contributed to the Mesolithic complex of the British Isles, having particular regard to those traceable in the earliest known industries of man in Scotland. The most significant are the Tardenoisian, probably from Flanders, and the Maglemosean from Denmark. The imposition and growth of these Continental strains, some upon the native Creswellian, their blendings and mutual reactions were factors in

[1] Garrod, 1926, pp. 40–43.

[2] Armstrong, 1925, 1931.

[3] e.g. Burkitt, 1925; Childe, 1931; Clark, 1936 (*a*).

this evolution of culture during the Boreal and Atlantic climatic phases. The industries, which then developed and spread into the regions vacated by the New Drift ice, are considered in this chapter mainly in the light of their northward extension as found in England. Such a review is necessary for a proper understanding of the colonization of Scotland, but it would not be complete without some notice of Mesolithic survivals into the Neolithic and even later stages of man's cultural development.

4. THE QUESTION OF AZILIAN INFLUENCES IN BRITAIN

The Azilian culture of Pyrenean origin would not be mentioned here were it not that its strains have long been thought to have reached the north of England, and that its traditions spread to Scotland and there influenced certain stone and bone industries. Named after a great cavern at Le Mas-d'Azil (Ariège), its distinctive industry was found stratified between a Late Magdalenian and a Neolithic layer.[1] The Azilian industries, which show regional variations, evince a debased Magdalenian aspect, modified it is believed by elements brought into France by immigrants from the Iberian and Italian peninsulas.[2] Everywhere their association is with the remains of animals such as still inhabit western Europe, and therefore the successors of the hardy Pleistocene fauna so faithfully represented by the Magdalenians in their cave art. The output of the Azilian industries comprises pebbles ornamented with red daubs or incised lines, steeply edge-dressed stone tools, including round scrapers, small knives, and triangular forms. Flat and barbed points in the tradition of Late Magdalenian types, many holed in the manner of harpoons, and other implements made in red deer antler are characteristic. Adze- and chisel-like antler implements and some pebble tools indicate adaptation to an environment of developing forests.

The growth of this epipalaeolithic culture from the withering Magdalenian stem is assignable to the Pre-Boreal and Boreal climatic phases. There would thus have been time enough for it to infiltrate into Britain during the Early Post-Glacial period, but the distribution of the Azilian culture in France, which was in the main similar to that of the parent Magdalenian, excludes the north-eastern part of that country where the land-bridge existed during the emergence. In the absence of relics indicating that Azilian strains reached south Britain by this direct connexion, it has been suggested that they were borne northward by way of the extended coastal grounds. It is, however, a far cry from south-western France; besides, the fenlands of the reclaimed sea-floor would hardly offer inducement enough to small bands, essentially rock-shelter dwellers in valleys, to forsake well-stocked grounds and rivers. Naturally, had there been such movements of people the migrants would in the course of generations have adapted themselves to a new environment, though all traces of their encampments would be lost during the marine transgression of the Atlantic climatic phase.

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[1] Piette, 1889; Déchelette, 1934, vol. i, pp. 314–21.

[2] Peyrony, 1948, p. 117.

While, then, there is a theoretical possibility that descendants of the Azilians could have reached what are now the English and Welsh coasts of the western waters, it seems that the weight of argument is nevertheless against their having done so. Neither in these regions nor beyond have there been found remains definitive or comprehensive enough to prove that Azilian traditions passed from south-western France. Steeply dressed round scrapers, angular points, and abruptly retouched blades from the Middle Zone in Mother Grundy's Parlour, Creswell Crags, have suggested to some students Azilian influences upon the surviving Creswellian. To most, however, these implements indicate more certainly the trend in late Creswellian industry, as in its Continental Upper Palaeolithic equivalents, towards the production of geometric microlithic types.[1] This zone has another claim to attention, for its archaeological contents were found with the bones of a fauna which included the red deer (*Cervus elaphus* Linn.) and the great ox (*Bos primigenius* Boj.).[2] These species testify to the milder climate under which the associated flint industry developed, for in the underlying Basal Zone they are unrepresented in the Upper Palaeolithic context of artifacts and bones of cold-resisting Pleistocene animals.

5. NORTH-WESTERLY MIGRATIONS BEYOND THE NORTH MIDLANDS

A migratory wave, initiated possibly among late Creswellian bands spreading northward over the then uplifted bed of the Irish Sea, and probably the first which penetrated into the Highland Zone west of the great Palaeozoic ridge since an early phase of the retreat of the New Drift ice, is denoted by a group of remains from the Victoria Cave, Settle, west Yorks. Hence this station, which has furnished the northernmost traces of

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[1] Clark, 1932, p. 20.

[2] Armstrong, 1925, p. 155.

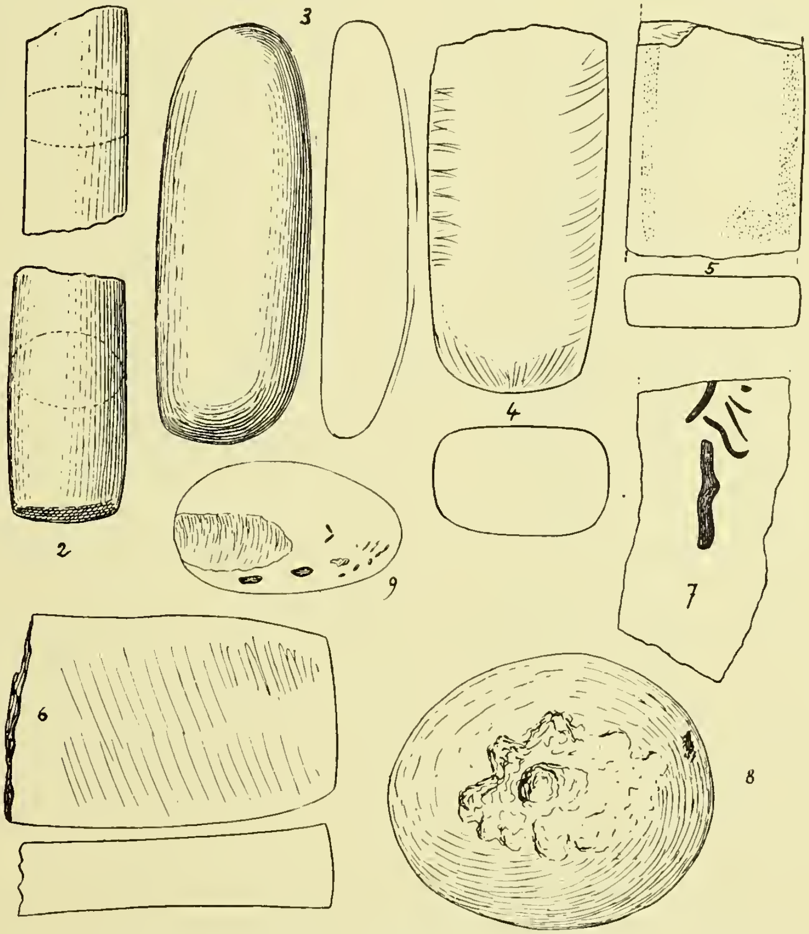

FIG. 36. Sandstone and schist implements from Victoria Cave, Settle, W. Yorks. (½) (After Breuil, 1922.)

Upper Palaeolithic man,[1] also throws light on the earliest movements of man beyond the North Midlands during the first part of the Mesolithic Age in Britain. For, from the stratum underlying a Romano-British (Iron Age) bed, excavators long ago retrieved several objects. These consisted of a colour manufacturer's kit—sandstone and schist pounders, palettes and grindstones with black and red grease-bound patches (Fig. 36)—besides a bilaterally barbed point with a slight medial bulging and curving, notched in the lower part for hafting (Fig. 37), a bone borer, and some small steeply retouched flint flake-tools.[1] The barbed point, partly fossilized, has recently been recognized as having been made of the antler of red deer[2] and not, as always stated, of reindeer. This accords with the character of the early post-Pleistocene animal remains recovered with the industrial products in the Middle Zone at Mother Grundy's Parlour. It is unlikely, therefore, that there can be any great disparity in age between this assemblage and the

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[1] Garrod, 1926, p. 120; above, p. 25.

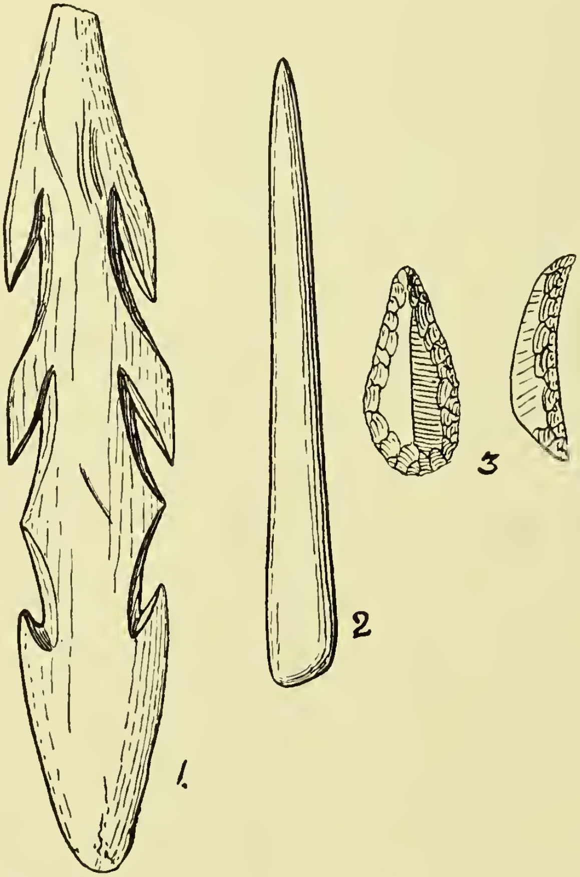

FIG. 37. Barbed point (no. 1) and awl (no. 2) of red deer antler, and a flint implement (no. 3) from Victoria Cave, Settle, W. Yorks. ($\frac{7}{8}$) (After Breuil, 1922.)

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[1] Breuil, 1922, pp. 275–89.

[2] Wright, 1939, p. 126.

group of implements from the Victoria Cave. For man's sojourn, as represented here, may well be referable to a contemporary phase of migration beyond the Creswell Crags, a migration which bore the elements of late English Upper Palaeolithic culture towards the trough of the Irish Sea and north-westerly into Ireland, and thence into Scotland by the fenland routes provided by the emergence. This will appear from the evidence of artifacts which will be discussed in the next chapter (pp. 124–6).

6. THE TARDENOISIAN CULTURE

(A) THE TARDENOISIAN OF THE CONTINENT. Long ago, collectors observed that certain sites in France, especially in sandy scrubby areas, yielded microliths (small steeply edge-dressed flint implements made in flakes and blades), the more remarkable of which were geometric in shape. It was recognized that many of these objects resembled certain Upper Palaeolithic forms, and some workers shrewdly thought that they represented a stage of culture between Upper Palaeolithic and Neolithic. From their abundance around Fère-en-Tardenois (Aisne), near Rheims, the facies came to be known as *Tardenoisian*.[1] The connotation of this term is now considerably extended. From the first, the minutely trimmed artifacts have had a peculiar fascination for prehistorians, and have stimulated fruitful inquiries from many quarters.

Typological series demonstrating the evolution of the Tardenoisian can be marshalled from surface-finds. But it is only from excavations and methodical researches that the true place of the culture has been determined. In caves and rock-shelters its industries, which entirely lack Neolithic elements, have been found associated with a fauna similar to that of the present day and between late Upper Palaeolithic and Neolithic deposits.

The Proto-Tardenoisian may have been coeval with the Azilian which locally succeeded the Magdalenian in south-western France.[2] That the *full* Tardenoisian, however, appeared later than the Azilian in that region has been shown at several stations. At two near Sauveterre-la-Lémance (Lot-et-Garonne) it was found to overlie the Sauveterrian, which was in part contemporary with the final Azilian. Here it persisted into the Neolithic, or, as in other parts of the same district, long after the true Azilian had died out.[3]

[1] de Mortillet, 1896.

[2] Coulonges, 1931.

[3] Ibid., 1935, pp. 25–32.

The Tardenoisian is thought to have originated in North Africa, which region the Magdalenian culture never reached. There, responding to a changing environment, the industries of the Late Capsian, in common with the European and Palaeolithic equivalents, developed a strong microlithic element. In Africa this comprised geometric forms, in the preparation of which the specialized micro-burin technique of cutting flakes and blades was favoured. This method is claimed to have been invented at Sebil, Upper Egypt, in an industry contemporary with the Early Aurignacian of France.[1]

Since the same changes which improved the climate in Europe fostered the desiccation of the African continent from the Sahara to Egypt, the exponents of the Late Capsian industries gradually forsook the parched regions and migrated in several directions.[2] That their strains entered Europe at both ends of the Mediterranean is evidenced by characteristic implements in Palestine, Italy, and Spain.

The Tardenoisian spread in the southern part of the north German plain, in the Danube basin, over the less forested areas of Poland, and extended into the Ukraine and Crimea.[3] Among its industries, scattered beyond north-eastern France and the Low Countries, those of Zonhoven and river valleys in Belgium have provided typological standards for comparisons. Three Tardenoisian facies, Early, Middle, and Late, have been distinguished.

At Zonhoven the Early or Lower Tardenoisian overlies an industry of Upper Palaeolithic aspect, strong in microliths,[4] and referable to the Pre-Boreal climatic phase.[5] It is typified mainly by implements made on relatively broad blades. Its products include microlithic points blunted obliquely or along an edge, and a few triangles (Fig. 38, series *A*). The Middle Tardenoisian is well represented in the valleys of the Amblève, Ourthe, and Vesdre.[6] Its tendency to narrow blades is shown by an abundance of small microliths, including such regular geometric types as segments or lunate forms, triangles, and a few trapezes. Hollow-based points appear, and simple forms persist (Fig. 38, series *B*). In the Upper or Late Tardenoisian industries of Zonhoven all the forms of the Middle phase survive. Trapezes made on pieces of broad blades are numerous, as

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[1] Vignard, 1931, pp. 92–103.

[2] Peyrony, 1948, p. 128.

[3] Clark, 1936 (*a*), p. 190; Breuil, 1937, p. 65.

[4] Hamal-Nandrin and Servais, 1909.

[5] Clark, 1936 (*a*), p. 220.

[6] Lequeux, 1923, pp. 37–122.

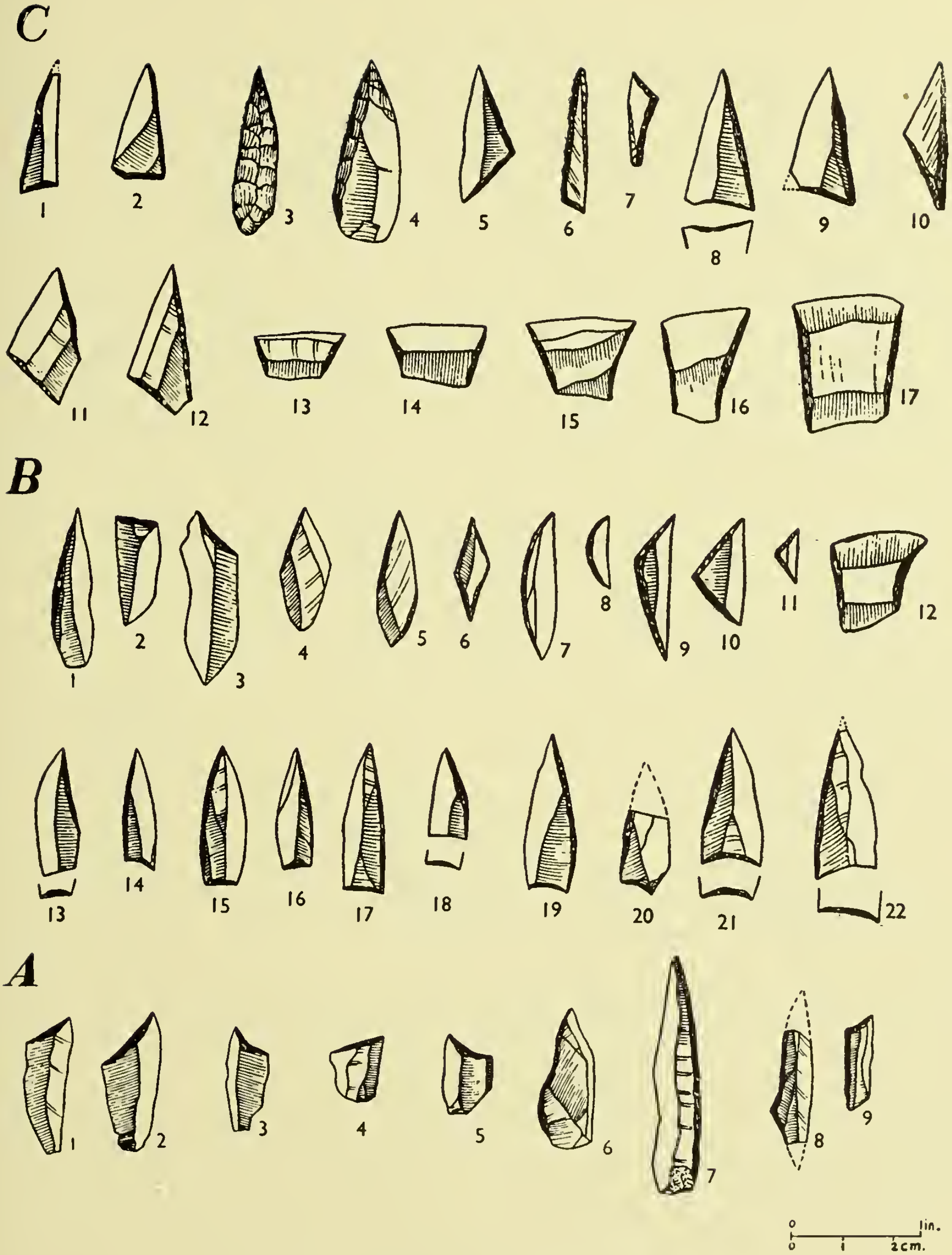

FIG. 38. Stages in the Belgian Tardenoisian.

C. Upper or Late, from Zonhoven (redrawn by Clark, 1932, from Hamal-Nandrin and Servais, 1922);

B. Middle, from the valleys of the Amblève, Vesdre, and Ourthe (redrawn by Clark, 1932, from Lequeux, 1923);

A. Lower or Early, from Zonhoven (redrawn by Clark, 1932, from Hamal-Nandrin and Servais, 1922).

also are small lanceolate points surface-flaked all over the convex face, and sometimes partly treated on the other face (Fig. 38, series *C*).

Although the microlith-manufacturers, who spread over the Old World, used convenient caves, they were essentially squatters in the open. But they constructed shelters and covered pit-dwellings. They favoured sandy upland areas and coastal strips, and settled along the margins of lakes and on river-banks. That their habitats were mainly in forest-free localities is reflected by industries which do not include tools for coping with pieces of wood of any size. Theirs may be said to be industries of armatures, for many of their diminutive stone artifacts were certainly meant to be inserted in holders of bone, as shown, for example, at Ensdorf, Bavaria, where the three Tardenoisian facies have been found stratified.[1]

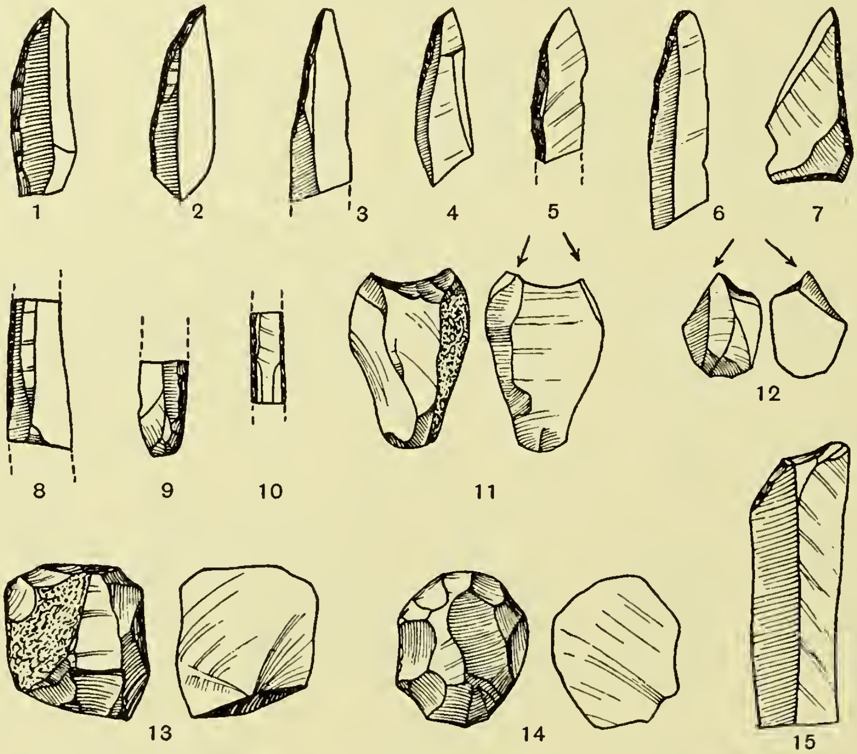

FIG. 39. Mesolithic flint industry from the Upper Middle deposit in Mother Grundy's Parlour, Creswell Crags. ($\frac{1}{1}$) (Redrawn by Clark, 1932, from Armstrong, 1925.)

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[1] Clark, 1936 (*a*), pp. 207–10.

Thin sticks may have served also. Hunting- and fishing-gear, and saws perhaps, were among the principal composite implements.

(B) THE TARDENOISIAN FACIES OF ENGLAND. The native English Upper Palaeolithic, which in common with its Continental equivalents tended as it developed to the production of microliths, actually persisted long enough to come locally under Tardenoisian influence early during the Boreal climatic phase. This intervention in the North Midlands is demonstrated by stratigraphy and artifacts at Mother Grundy's Parlour (Fig. 39).

1. *The early facies.* From the Upper Middle Zone Tardenoisian elements (Fig. 39, e.g. no. 10), including micro-burins (Fig. 39, no. 12)—these important indicators of Tardenoisian methods—have been recovered among surviving Creswellian forms (Fig. 39, particularly nos. 1–6, 11, and 15), and were associated with the bones of a fauna not markedly different from that of the Middle Zone. They resemble relics of the Early Tardenoisian 'broad-blade' industries of Zonhoven, Belgium.

These relics from the upper horizon of Mother Grundy's Parlour record seasonal rather than fixed occupation of the rock-shelter,[1] for, under the improving climate, communities tended to live more in the open and, becoming more numerous also, were tempted to spread. In the southern Pennines they probably came into close contact with earlier migrants whose predominantly Upper Palaeolithic equipment they reinforced. Gradually making their way northward by the east side of the Pennines, they encamped mainly on the treeless high grounds up to 1,250 feet above sea-level.

Bands equipped like those on the uplands of the Pennines deployed into the lower valleys in the east and north-east, and eventually gained the coastal grounds. Their traces have been found at many places on the seaboard from the Hartlepools, Co. Durham, to Budle Bay, Northumberland.[2] These folk chose sites on the lower ranges of cliffs, near fresh water and within access to the beach in the neighbourhood of rock-pools. Inland they squatted along river-banks and on the margins of old glacial lakes. Such settlements indicate that these food-collectors depended on small game, fish, and molluscs for their sustenance.

The industries of the north country are more developed versions of the mixed assemblages from the Upper Middle Zone of Mother Grundy's

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[1] Armstrong, 1925, p. 173.

[2] Raistrick and Gibbs, 1934.

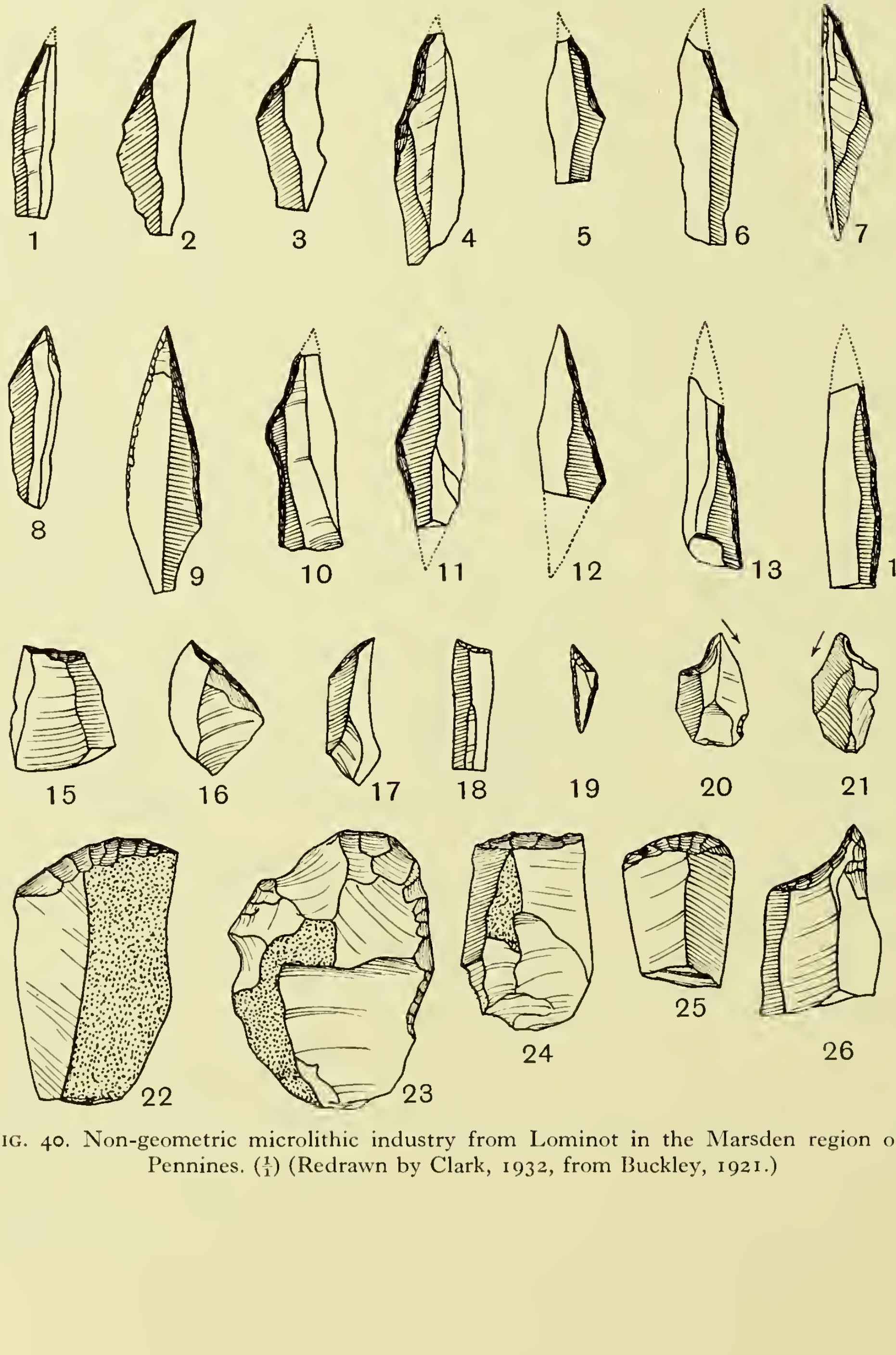

FIG. 40. Non-geometric microlithic industry from Lominot in the Marsden region of the Pennines. ($\frac{1}{1}$) (Redrawn by Clark, 1932, from Buckley, 1921.)

Parlour. They demonstrate their relationship to the Early Tardenoisian of Belgium in the free use of broad blades for the manufacture of non-geometric microliths (Fig. 40).[1] As shown by such implements as steeply dressed complete flakes and blades, and core-scrapers, they derived much from the decayed Creswellian, whose roots lie in the Aurignacian of the Continent. The hybrid facies distributed in north-east England may be said, therefore, to have been evolved upon Continental early Mesolithic forms, which intruded upon the native Upper Palaeolithic and stimulated the trend already present in it to the production of microliths.

These growths in England paralleled those of the Early Tardenoisian of Belgium as illustrated at Zonhoven, where the 'broad blade industry' was found to overlie relics apparently related to the facies typified at Remouchamps near Spa. Although strong in its microlithic element, this retains, nevertheless, many traits of its Upper Palaeolithic ancestry (below, p. 111).[2]

It is interesting to observe, therefore, that a Mesolithic flint industry in King Arthur's Cave, Ross-on-Wye, which is associated with an almost modern fauna, includes no Tardenoisian forms whatever.[3] At this site there occur only microliths evolved from the local, final and underlying Upper Palaeolithic types found with the bones of Pleistocene animals. Similar developments on Upper Palaeolithic stocks have been noted at cave-stations in Wales.[4] They are also strongly suggested at open-air sites in the Scunthorpe region of Lincolnshire and in Norfolk.[5] It has yet to be shown, however, that the microlithic industries found in outlying parts remote from the east coast—for example, Devon and Cornwall—derive anything from a site or spread of Upper Palaeolithic culture.

2. *The late facies.* A late microlithic facies developed in England during the Boreal climatic phase on the growths which had been influenced by the Early Tardenoisian strains. It was strengthened by contributions from the Middle Tardenoisian of Belgium which entered southern and central England. This new, developed facies was probably well established before the maximum transgression of the Early Post-Glacial sea. Alone among evidence pointing to this fact is a microlithic flint industry, contained in peat below an Early Neolithic level at Peacock's Farm, Shippea Hill, Cambs, for it has been determined by pollen-analysis to lie near the

[1] Buckley, 1924.
[2] Clark, 1936 (*a*), pp. 59–62.
[3] Clark, 1932, p. 38.
[4] Grimes, 1939, pp. 9–11.
[5] Clark, 1932, pp. 93–94.

Boreal-Atlantic transition.[1] This clutch of artifacts can be ranked with the rich microlithic industries found under sand-dunes at Wangford in the adjacent north-east corner of Suffolk. These in turn may be grouped typologically with the evolved Tardenoisian facies so well illustrated at Scunthorpe, Lincs. The surface-found assemblages from the eastern counties doubtless represent developments continuing into the Atlantic climatic phase, during which the English Late Mesolithic microlithic industries spread widely and flourished in Britain.

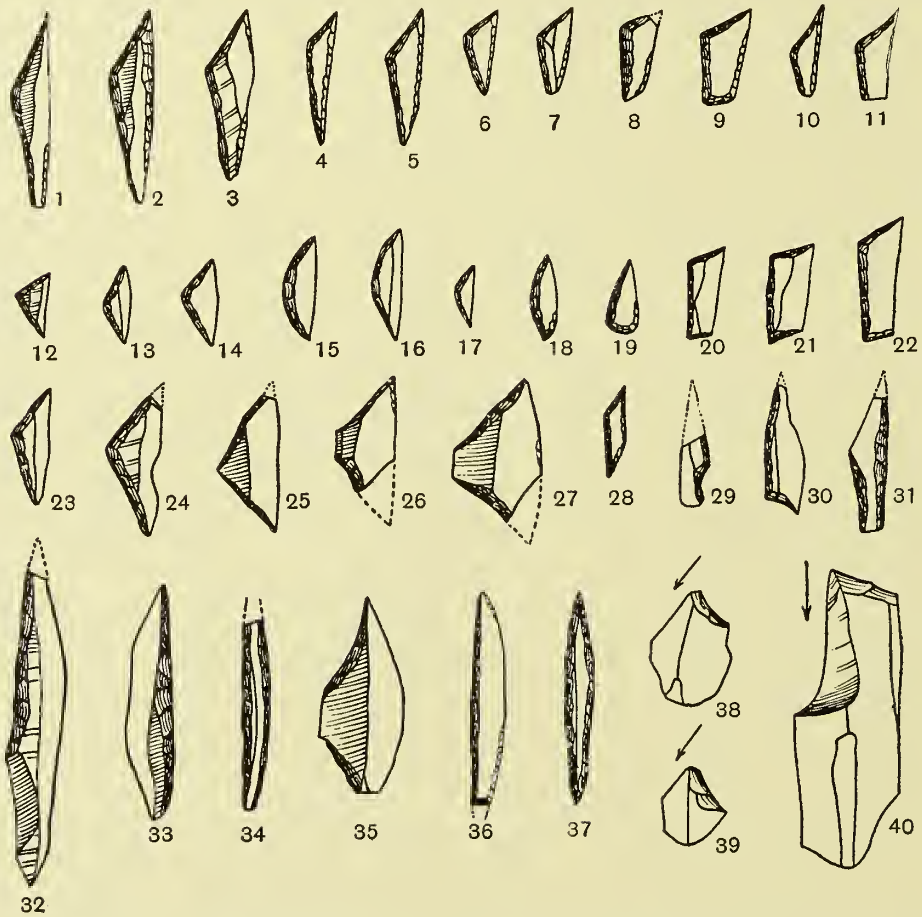

FIG. 41. Geometric microlithic industry from sites in the Marsden region of the Pennines. ($\frac{1}{1}$) (Redrawn by Clark, 1932, from Buckley, 1921.)

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[1] Clark, 1935 (*a*), p. 319.

West and north-west this advanced facies reached the coast of Wales and the Isle of Man.[1] In the south-west it penetrated to the seaboard of Cornwall. It is best represented in the southern Pennines, both in Lancashire and Yorkshire (Fig. 41), and it has been identified on the Cleveland Hills. Beyond, its relics have been recovered on river-banks and along the coast in Durham and Northumberland.

On Budle Bay, the northernmost sites in Northumberland, and therefore in England, the early microlithic facies (Fig. 42, Series I) has been separated typologically from the late (Fig. 42, Series II). Where stratigraphy reveals a long occupation by man, the change to narrow and smaller implements appears in the upper layers.[2]

Owing much to the influence of the Continental Middle Tardenoisian, the predominant characteristic of the English Late Mesolithic microlithic facies lies in the sub-geometric and pure geometric shapes, many of which are minute. This element includes a variety of narrow flake- and blade-implements, awls and points with steeply blunted edges, small abruptly retouched rods, besides scrapers and objects current in older groups. Many micro-burins testify to the vigour of the quite ancient flint-working tradition that is expressed in these by-products.

Despite the severing of direct connexions by the Early Post-Glacial Sea, Britain may have received some impulses from the Late Tardenoisian of the Continent. On the available evidence, however, it appears that the new artifact forms, evolved in Britain during the Atlantic climatic phase and resembling those of the contemporary advanced Tardenoisian of Zonhoven, were native outgrowths. Hence, whereas an Early, a Middle, and a Late Tardenoisian facies are known in Belgium, only an Early and a Late have been recognized in England. Among the forms apparently developed here may be mentioned the rare trapezes and trapezoids from the Wangford–Lakenheath site, Glen Wyllin in the Isle of Man, and from the Pennines.[3]

(C) TARDENOISIAN SURVIVALS. In many regions the Tardenoisian and even the more ancient microlithic traditions outlasted the Atlantic climatic phase. They hardly seem, however, to have influenced the Neolithic colonists who introduced the transverse arrow-head into Britain.

[1] Clark, 1932, pp. 46–50; 29–32.

[2] Buckley, 1925; Raistrick and Gibbs, 1934, pp. 191–2.

[3] Clark, 1932, p. 94, footnote.

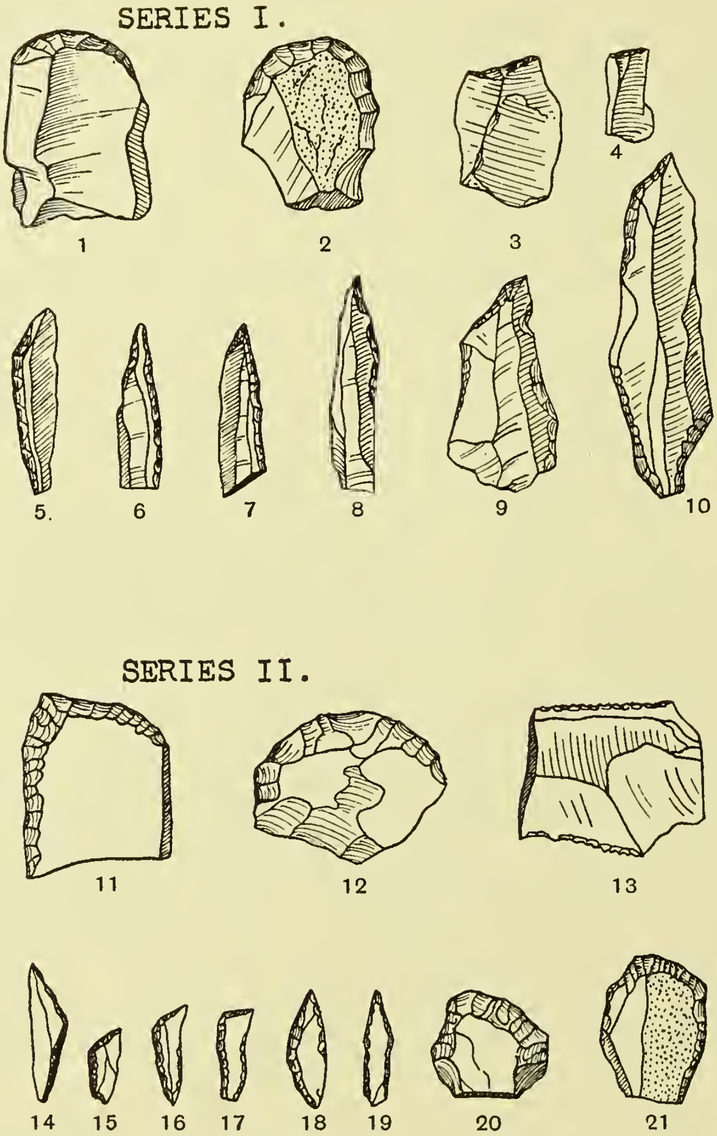

FIG. 42. Microlithic industries from around Budle Bay, Northumberland: Series I, early facies, Spindleston; Series II, advanced facies, Ross Golf Links; Budle Crags; Chester Crags. ($\frac{1}{1}$) (Redrawn by Clark, 1932, from Buckley, 1925.)

This new form was a development of the trapeze and evolved on the Continent, where the Mesolithic cultures were generally appropriated by the food-producers. Yet surface-flaked artifacts, certain types in microlithic industries, and the association of relics demonstrate that contacts took place between immigrants in early stages of metal culture and native hunters still making small implements in Tardenoisian and earlier styles. Since this peculiarity is so often seen in localities remote from the main centres of post-Mesolithic settlement, it suggests that in England the true Neolithic was of short duration.[1] Among sites south of the Border which have afforded illustrative series, those in Mendip and the Isle of Man are the best known and provide instances which will now be considered. As will become apparent, Scotland also shows abundant examples.

Records of microlithic industries producing forms of Early and Late Tardenoisian aspect under peat in the region of the Pennines are important in a review of the northward advance of man's cultures. In some instances a Sub-Boreal dating is indicated by the pollen-analysis of the sealing layer, and the associations of the flint implements point to the persistence of Tardenoisian tradition in the region, even into the Early Bronze Age. This, however, does not conflict with the preceding statement that Tardenoisian elements penetrated far earlier into the northern corner of Northumberland (above, pp. 103–5, 107). As we shall see, Tardenoisian strains, which appear to derive from these, appear in Scotland in industries going back to quite Early Atlantic times (pp. 148–9). This supports the contention of some palaeobotanists that the peat which overlies sand containing Early Tardenoisian artifacts in the Pennines is assignable on pollen-statistics to a Lower or Early Atlantic age. This assumption gives the stone industries a late Boreal age.[2]

Another microlithic facies has been recognized in Northumberland. Though not itself important, yet some of its ingredients are interesting because of the comparisons and affinities which they suggest. It is represented mainly by crude pebble industries of archaic appearance from the Ross Links and Budle Crags near Bamburgh Castle, Belford.[3] To find a group comparable to the Northumberland series for its forms of a degenerate Tardenoisian aspect we turn to an assemblage of Late Neolithic or Early Bronze Age manufacture from the flanks of the Castlereagh Hills in

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[1] Clark, 1932, p. 96.

[2] Raistrick, 1933, pp. 197–8.

[3] Whelan, 1938, p. 135.

Co. Down.[1] Counterparts of the most distinctive of these artifacts occur in Scotland.

7. THE MAGLEMOSEAN FOREST CULTURE

(A) ORIGINS. The Maglemosean culture of multiple parentage was cradled in the Baltic area. Deriving mainly from the Upper Palaeolithic of eastern Europe, it owed much to the aptly termed Tanged-point cultures. By the end of Late-Glacial times these had become distributed over the European plain from Belgium to the Ukraine. The relics of several constitute the earliest evidence of man in the eastern part of the North Sea basin, and in the Baltic lands which were dominated by the movements of the Fenno-Scandian ice.

The ancestry of the Tanged-point cultures lay in the blade-industries of nomad hunters. As the ice-sheets melted away, the small scattered communities increasingly produced obliquely blunted implements which were shouldered for hafting. Many of these recall the Font-Robert forms of the evolved industries of the Aurignacian complex. Following the reindeer in its seasonal migrations, bands of the late Upper Palaeolithic peoples penetrated ever farther into the liberated territory. They eventually encamped in the lower Elbe basin, and there developed the curious Hamburg culture.[2]

The Hamburg flint industry is characterized by pronged tools and shouldered points. The bone-work consists mainly of barbed points of reindeer antler prepared in a specialized manner. Faunal associations and pollen-analysis indicate that this late decayed Upper Palaeolithic culture is assignable to Early Dryas time (the first Sub-Arctic phase, or Zone I of the Baltic Late-Glacial–Early Post-Glacial climatic sequence; above, p. 62). It probably endured until the end of the subsequent Allerød oscillation (Zone II, *c.* 10,000–8300 B.C.; above, p. 62) of the Götiglacial Period of retreat.

The cultures evolved after the retreat, until the end of the Atlantic climatic phase, belonged to the Mesolithic complex. Geochronology, the history of the Baltic water bodies, faunal remains, and pollen-analysis permit of their being grouped into three periods of *Forest Culture*, corresponding to the Pre-Boreal, Boreal, and Atlantic climatic phases.[3]

The Tanged-point industries of the Ahrensberg–Lavenstedt facies of north Germany were the successors of the Hamburg culture and the immediate forerunners of the richer industries of Baltic Forest Culture Period I, with which they are usually grouped. They preserved some of the stone-working traditions of the Hamburg industries. Stratigraphy and pollen-analysis indicate that they can be assigned to Upper Dryas time, to the second Sub-Arctic phase, Zone III (above, p. 62), or the spell of renewed cold corresponding to the halt which, marked by the Fenno-Scandian End-Moraines, terminated the Götiglacial Period of retreat. Among regional variations, the somewhat later industry recovered at Remouchamps under an Early Tardenoisian relic-bed has been mentioned in the preceding section (p. 105) because of its retention of Upper Palaeolithic features. But it is remarkable also for its simple microlithic element and small tanged implements associated with reindeer remains. Reference has already been made to its affinities with the industry found underlying an Early or Lower Tardenoisian at Zonhoven (pp. 100, 105).

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[1] Whelan, 1938, pp. 133–5, and below, p. 253 and Fig. 113.

[2] Rust, 1937.

[3] Clark, 1936 (*a*), chapter vi.

During the succeeding Finiglacial Period of retreat—covered by the Pre-Boreal climatic phase Zone IV, Baltic Forest Culture Period I, *c.* 7800–6800 B.C. (Chapter III)—settlers in boggy places, on the banks of lakes and rivers in northern Germany, southern Sweden, and particularly at Lyngby in Jutland, besides manufacturing tanged implements, devised true axe and adze forms.[1] These were usually self-hafted, being made in one piece from the main shaft and part of the brow-tine of a reindeer antler. These additions are the first signs of man's adaptation to the increasing vegetation and developing forests in those parts of Europe which had so long lain under ice. During the Pre-Boreal climatic phase Tanged-point culture groups, skirting the remnant ice-field, reached the Atlantic coast in Scandinavia by way of the Arctic seaboard in Carelia and Finmark. Such localities as Komsa, Fosna, and Garnes have yielded their characteristic stone tools. Among these the most noteworthy are crude axe- and adze-heads made in pebbles, and slate tanged arrow- and spear-heads with a feeble sort of barbing.

(B) DEVELOPMENTS IN THE BALTIC REGION. In southern Sweden the Lyngby culture survived into the Boreal climatic phase, during which the strains and traditions mentioned were absorbed in the Maglemosean (Zones V and VI, above, p. 63), Forest Culture Period II (*c.* 6800–

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[1] Clark, 1936 (*a*), chapter ii.

5000 B.C.). This was developed on moors, upraised places in marshland, islets, lake-shores, and river-banks, while the Baltic trough was occupied by the Ancylus Lake and the sea-level outside was low, and land-connexions existed between the Continent and Britain. The appropriateness of its designation, from the Danish *magle mose*, 'big bog', is evident. It is interesting to observe here that, during the long period of time covered by the growths which in Baltic lands and around the Ancylus Lake culminated in the rise of the Maglemosean culture, the Creswellian of England had continued virtually without reinforcements from outside, and had hardly spread beyond our North Midlands.

The versatility of the Maglemosean people is shown by stone tools, objects made in wood, in fibre and bast, in bone, in the antler of elk and red deer. Their industries clearly reflect the environment of water and birch-pine forests of Boreal times. By then the reindeer and other specialized animals had mostly retired far north,[1] and had generally been replaced by a fauna similar to that of the present day.

An advance in the working of stone appears in an early Maglemosean industry in Sweden,[2] where indications of grinding are seen upon pebbles, roughly planed by pecking and brought to a cutting-edge by a bevelling on one or both faces (Fig. 43, no. 1). Hammers and mace-heads were also prepared in pebbles, which were adapted for easy holding or hafting by partial or complete perforation (Fig. 43, nos. 2 and 3). Fixed into a sleeve or holder of bone, antler, or wood, often perforated to receive a haft (e.g. Fig. 43, no. 4), the Maglemosean cutting-tools of stone were far superior to the Lyngby implements made in reindeer antler. The tradition of these survived, however, in the plain and holed tools which, resembling axe- and adze-heads, are probably to be regarded as blubber- and fat-mattocks (Fig. 43, nos. 5 and 6). Fashioned in red deer antler, these occur so commonly among Maglemosean remains as to be typical of Baltic Forest Culture Period II. Among comparable heavier implements may be ranked the somewhat rare bone daggers (e.g. Fig. 43, no. 7).

In the large repertory of Maglemosean fishing- and fowling-gear, bone and antler hooks (Fig. 43, no. 8), gorges, and points are prominent. The last are particularly important when viewed from the angle of typology.[3]

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[1] The reindeer, though preferring to seek more congenial conditions nearer the dwindling ice, nevertheless adapted itself locally to a changing environment, which it encountered in southern Baltic lands until Boreal times. (Cf. p. 89.)

[2] Clark, 1936(*a*), Fig. 33, no. 10, p. 105.

[3] Ibid., pp. 110–23.

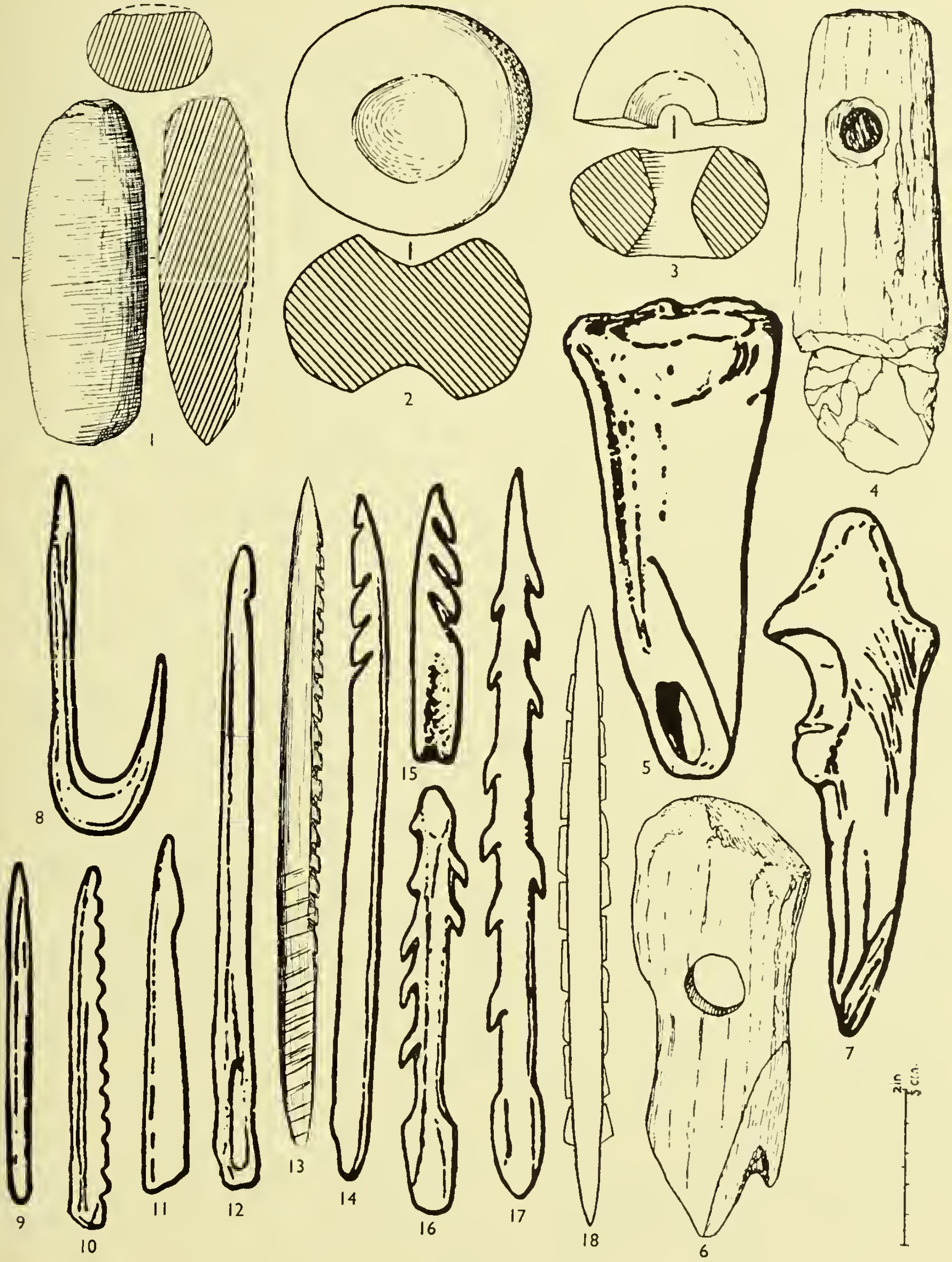

FIG. 43. Maglemosean stone, bone, and antler implements. No. 1, from Clark, 1936, after Niklasson, Alin, and Thomasson, 1934; nos. 2 and 3, after Clark, 1936; nos. 4 and 6, from Clark, 1936, after Friis-Johansen, Jessen, and Winge, 1918–19, 1920; nos. 5, 7–12, from Obermaier, 1925, after Reinecke, 1908; no. 13, after Clark, 1932; nos. 14–17, from Obermaier, 1925, after Reinecke, 1908; no. 18, based on specimen in the Wellcome Historical Medical Museum, London. These are from the Baltic area and eastern basin of the North Sea, except no. 13, dredged from the Leman and Ower Sands off the coast of Norfolk (below, p. 114).

They range from the simplest forms, which may even have been used as pins or awls (e.g. Fig. 43, no. 9), to objects barbed along one or two sides. A selection only is figured here (Fig. 43, nos. 10–18), but this is enough to show that the barbs and jags vary greatly in number and shape, from simple notching to formidable recurved thorn-like projections, and small flint flakes inserted in longitudinal grooves in bone heads (Fig. 43, no. 18).

None of these barbed points, save possibly the rare examples with a basal perforation, could have served conveniently as harpoons. Evidence such as that of comparative ethnography indicates rather that they were leisters, spears, javelins, or parts of composite devices for capturing fish and birds.[1] Hence it is as incautious to use the term 'harpoon' for most Maglemosean points as it is for their Magdalenian prototypes.

The decoration of small bone and antler objects, such as daggers, whistles, domestic implements, and weapons of the chase, had a place among Maglemosean activities. Engraving by simple lines, pricking, and drilling was used in forming geometric patterns and conventionalized representations of human beings and animals. This art may not have had behind it the motives which inspired the cave-dwellers in France and Spain. Yet, such as it is, it shows that in one more aspect Upper Palaeolithic traditions survived in the Maglemosean culture, with those of the other facies to which reference has already been made.

(C) DISTRIBUTION. 1. Using boats, built more probably of birch-bark or skins than hollowed out of logs, the Maglemoseans negotiated the innumerable watercourses which traversed the vast fens of the extended European plain. The place and influences of their culture, which thus reached Britain, are now better understood as a result of the collaboration of geologists, palaeobotanists, and archaeologists.

A bone point, of the Kunda (Esthonia) type, finely denticulated by oblique notching along one side (Fig. 43, no. 13), which was found embedded in moorlog of Boreal age,[2] and dredged from the bed of the sea between the Leman and Ower Sands off the Norfolk coast, testifies to the reality of the hunting-grounds and the routes afforded by the emergence (above, pp. 51–53, 63). This chance find and comparable bone points, antler, and flint implements show also that a main focus of Maglemosean settlement in Britain lay in the south-east. In this region colonists well equipped to cope

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[1] Clark, 1936 (*a*), pp. 115–24.

[2] Idem, 1932, p. 115.

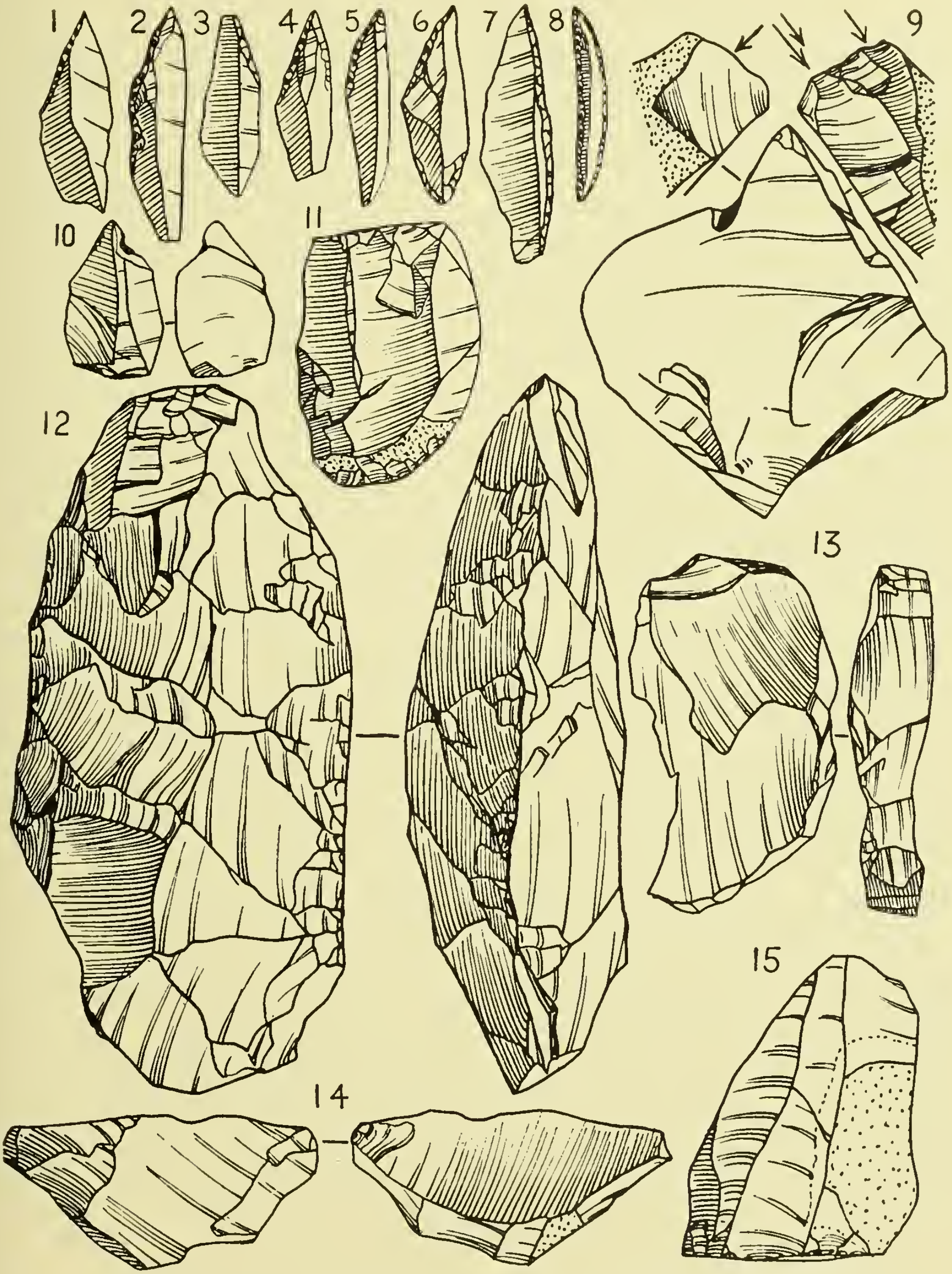

FIG. 44. Flint industry of Maglemosean types from Broxbourne, Herts. ($\frac{1}{1}$) (After Warren, Clark, Godwin, H. and M. E., and Macfadyen, 1934.)

with developing forests ventured far into broads and up river valleys. There they encamped seasonally in the same environment as did their congeners around the Ancylus Lake and in the North Sea fens.

Among bone objects may be mentioned barbed and notched points from Royston, Herts (Fig. 44, no. 5), Battersea (Fig. 44, no. 6), and Wandsworth (Fig. 44, no. 7).[1] The last two, resembling the point dredged from the Leman and Ower Sands, were retrieved from the bed of the Thames, as was a perforated adze-head of ox-bone, decorated with incised lines. Similar ornamentation appears on a tine of red deer antler found in muddy sand mixed with gravel on the flood-plain of the River Test at Romsey, Hampshire.[2] It is a matter of speculation whether this specimen represents an extension of Baltic influences from the Thames valley or from north-eastern France. It will be recalled that a line-decorated, perforated antler sleeve was found in the lower reaches of the Somme at Crouy, and that a few barbed bone points of Maglemosean type were recorded from Flanders.[3]

The stone industries are typified by worn flakes, scrapers, obliquely blunted blades, non-geometric microliths, micro-burins, cores and core-scrapers, and *tranchet* axes on cores. At Kelling, Norfolk, such a group has been recovered from gravel under the top-soil. On the flood-plain in the valleys of the Thames and its tributaries, from Thatcham and Newbury, on the Kennet in Berkshire, to the London district downstream and the Colne valley in Essex, several series have been noted in shell-marl under peat. This bed, which at Broxbourne, Herts, on the Lea, was found to overlie a comprehensive assemblage, has been determined by pollen-analysis to be of Late Boreal age.[4] The group illustrated (Fig. 44) includes the most typical forms of Maglemosean flint-flaking industry. Thus, there appear microliths (nos. 1–8), a thick graver (no. 9), an ordinary scraper (no. 11), and a core (no. 15). As waste, the micro-burin (no. 10) is evidence of Tardenoisian methods in dividing fine flakes. The large *tranchet* (no. 12), made in a core, and the two thick flakes (nos. 13 and 14), waste from sharpening *tranchets*,[5] are outstanding.

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[1] Westerby, 1931, pp. 45–46; Clark, 1932, p. 18.

[2] R. A. Smith, 1934; Clark, 1936 (*a*), p. 236.

[3] Picard, 1836; Lartet and Christy, 1875; Clark, 1936 (*a*), p. 237.

[4] Warren, Clark, Godwin, and Macfadyen, 1934, pp. 124–7.

[5] The characteristic bezel forming the working-edge of the true *tranchet* was produced by a blow struck transversely at a corner of the flaked core, removing a characteristic flake. (See also Fig. 46, no. 5.) By repeating this treatment the knapper could at once resharpen the tool.

Various finds show that Maglemosean culture extended in the North Sea basin beyond the area of its distribution in south-east England. Those finds which date back to Boreal times come from lacustrine deposits under peat of Atlantic age in extinct meres at Hornsea and Skipsea Withow in the Holderness district of east Yorkshire.[1] Each place has yielded a toothed bone point of the early type (Fig. 45, nos. 1 and 2 respectively) recovered from the Leman and Ower Sands (above, p. 114). The faunal remains and archaeological evidence at Skipsea have been related by pollen-analysis to contexts of Forest Culture Period II in the Baltic region.[2] This analogy is upheld by the nearby discovery of flake-implements and a core-axe, all flint and peat-stained (nos. 3 and 4). Excavations at Seamer, south of Scarborough, have revealed in two seasons of work the existence of what stands so far as the most important Maglemosean station in Britain. The relics include the vestiges of dwellings built of branches, the products of an active red deer antler industry—including such fishing-gear as closely barbed points of the Kunda form, similar, therefore, to those from the other sites in Yorkshire—and also series of typical flint implements.[3] Additional evidence that this locality was much favoured by Mesolithic fen-dwellers is provided by comparable series of flints of Maglemosean facies found stratified, particularly on the south-east side of the Carrs at Flixton, where methodical diggings have recently been conducted.[4]

The marine transgression of the southern part of the North Sea floor, initiated soon after the peak of the emergence of Boreal times, prevented advanced Maglemosean elements from reaching Britain directly from Denmark. The Early Post-Glacial sea, however, had not developed sufficiently by Early Atlantic times to overwhelm the more northerly parts of the great fens. Migrants possessing a Maglemosean equipment succeeded, therefore, in penetrating far beyond what is now Yorkshire. In England their most northerly advance is most clearly indicated by flint implements, including a core-axe and a micro-burin, from the forest bed at West Hartlepool, Co. Durham.[5] A small point of bone, bilaterally though asymmetrically barbed, and perforated at the base in the manner of a harpoon, is stated to have been found in 1852 on the shore at Whitburn, twenty miles farther north.[6] Debased and bearing a general resemblance to an

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[1] Armstrong, 1922, 1923.

[2] Godwin, 1933, p. 38.

[3] Clark, 1949, 1950.

[4] Moore, 1950.

[5] Trechmann, 1936.

[6] Munro, 1899, pp. 55 and 57.

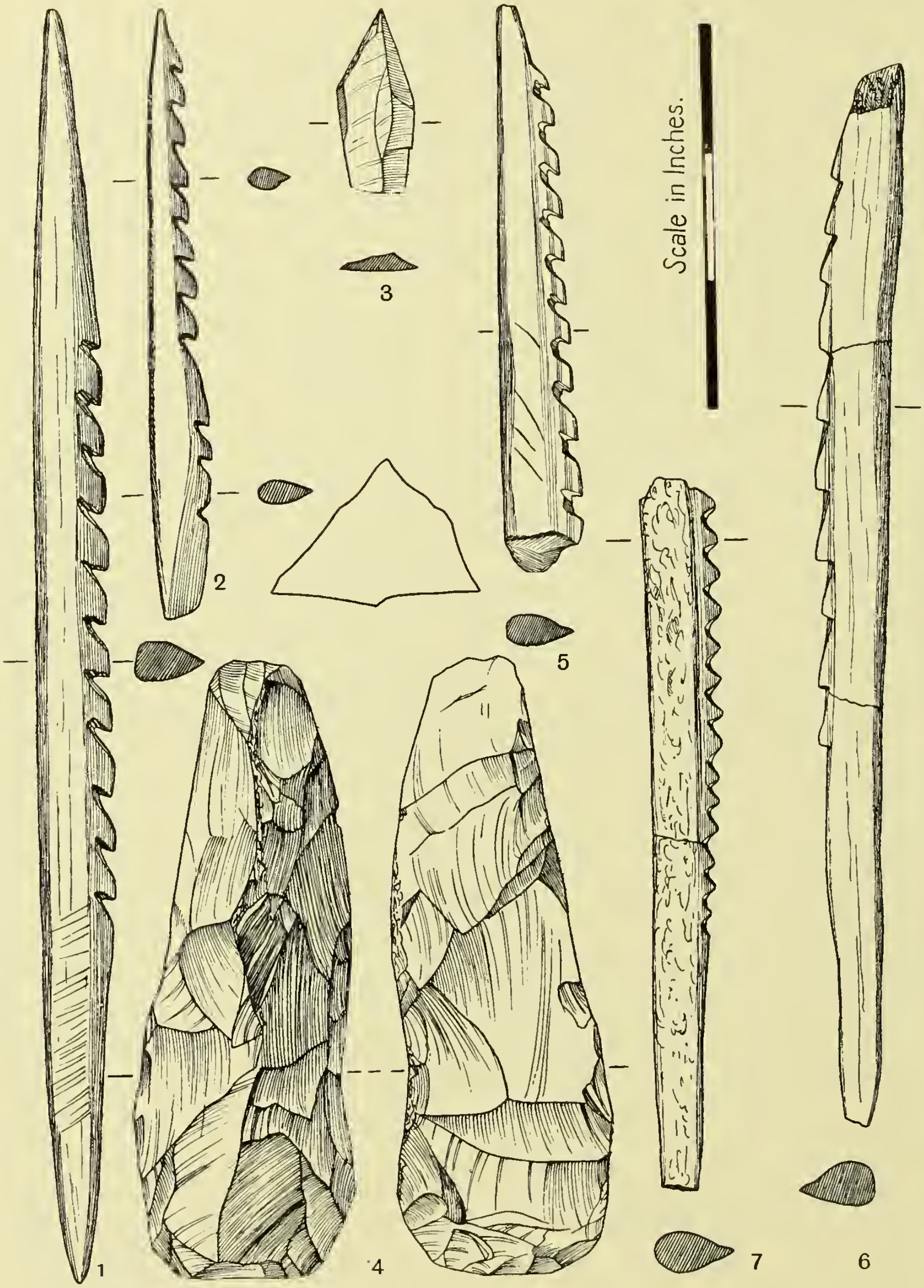

FIG. 45. Maglemosean types of bone and flint implements from English sites in the North Sea basin. No. 1, Hornsea, Yorks; nos. 2–4, Skipsea, Yorks; no. 5, borders of Cambs and Herts near Royston; nos. 6 and 7, Thames in London, respectively Battersea and Wandsworth. (Nos. 1–4, redrawn by Clark, 1932, from Armstrong, 1923; nos. 5–7, after Clark, 1932.)

Azilian rather than a Baltic form, it is nevertheless probably referable to a site on the line of contemporary man's northward march.

So far as we read the evidence, Maglemosean influences did not directly affect the scattered native late Creswellian industries of the rock-shelters and rare open-air stations. It would appear, however, that contacts did take place, probably in the lower basin of the Tweed between the Maglemosean and the developing Mesolithic culture (below, pp. 165–7), which, combining Creswellian and Early Tardenoisian, had advanced northward on the east side of the Pennines (above, pp. 103–5, 107–9). These fusions must have occurred quite early during the Atlantic climatic phase. The evidence is provided, not so much by suggestive surface-finds, as by significant types in dated industries from Scottish coastal sites.

2. The severing of connexions with the Continent led to the rise in south-east Britain of counterparts of the advanced Maglemosean and of the Ertebølle cultures of Baltic lands. A native forest culture is typified in an industry of Late Atlantic age under peat and marsh deposits on the south shore of the Medway estuary at Lower Halstow, Kent (Fig. 46).[1] It consists of a pebble with countersunk hollows (nos. 3, 4), gravers (no. 6), scrapers, and a few microliths (nos. 1, 2). Its heavy element includes core- and flake-axes and adzes with *tranchet* cutting-edges (no. 7), and the special form known as the 'Thames pick' (no. 8). (This narrow, long flaked type survived so long as flint was used in prehistoric times for tools in the region of the Chalk.) A coeval industry, richer in microlithic forms, has been reported from the old submerged land-surface ('Lyonesse') on the Essex coast.[2]

These industries, particularly as typified at Lower Halstow, diverge in certain details from their counterparts of Baltic Forest Culture Period III, as found in the Ertebølle refuse-heaps along the margins of the Litorina Sea. The latter are distinguished from the former mainly by their output of axes made on flakes, and by their microlithic element, which is composed almost wholly of *petit tranchet* forms doubtless evolved from the Continental Late Tardenoisian trapeze.

3. Late Mesolithic industries comparable with those of Lower Halstow are fairly distributed over south-eastern England. They include heavy *tranchet* forms and a varied microlithic non-geometric element.[3] Thus they

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[1] Burchell, 1925, 1927, 1928.

[2] Warren, Piggott, Clark, Burkitt, and M. E. Godwin, 1936.

[3] Clark, 1932, chapter iv.

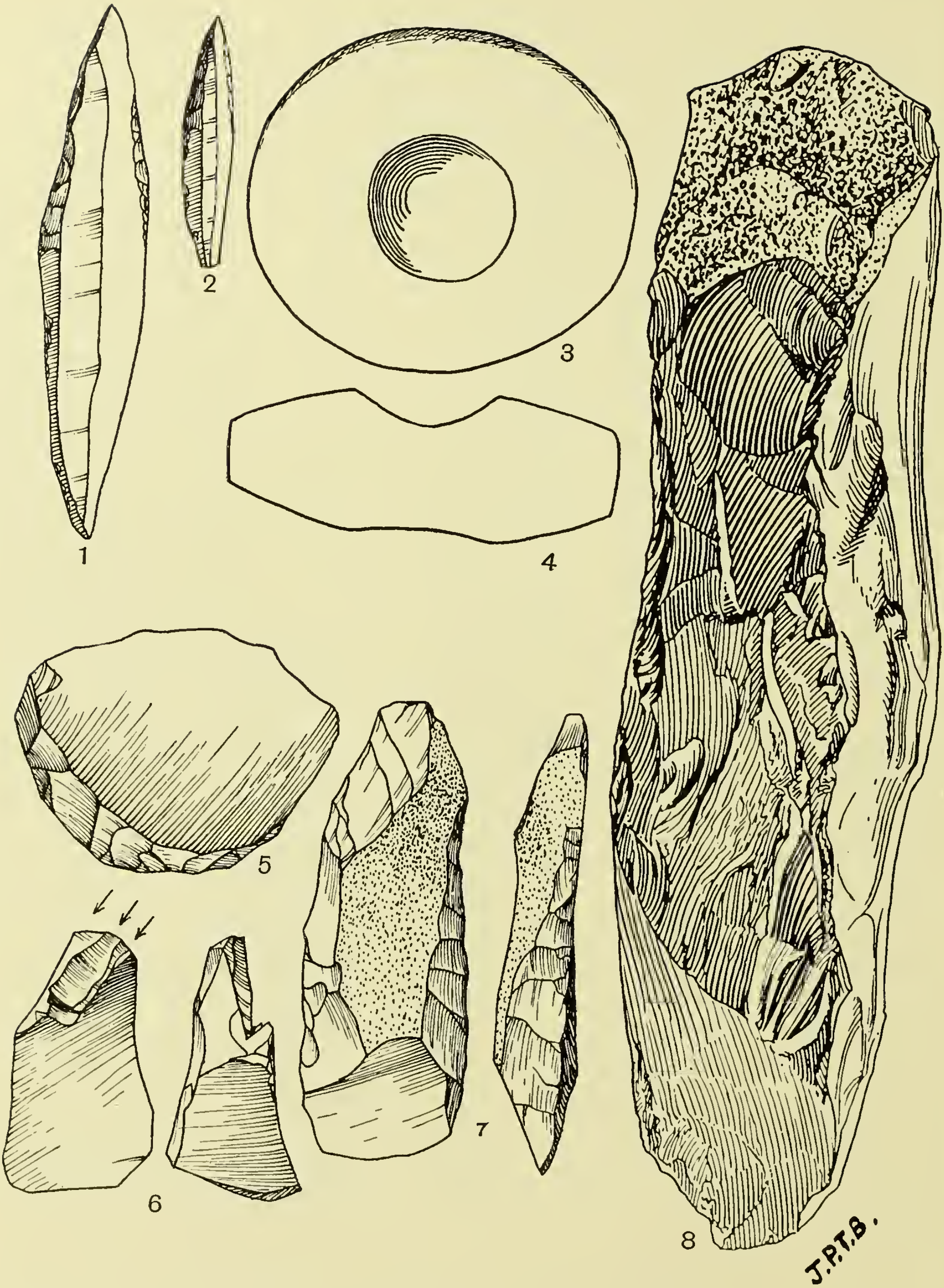

FIG. 46. Implements from Lower Halstow, Kent. (No. 1, twice actual size; nos. 2 and 8, actual size; nos. 3–7, two-thirds actual size. Nos. 1–4, redrawn by Clark, 1932, from Burchell, 1927; nos. 5–7, redrawn by Clark, 1932, from Burchell, 1925; no. 8, after Burchell, 1928.)

reveal that the Baltic Forest culture influence introduced during the Boreal climatic phase was stronger in this region than that of the Continental Middle Tardenoisian. These industries occur in East Anglia; and in the south the facies has been noted in the Isle of Wight. Prolific sites are scattered in the sandy high grounds of Kent, Surrey, and Sussex. Many variations appear in the microlithic groups, particularly in Sussex. The excavations of pit-dwellings at Selmeston and Hassocks in Sussex[1] and Farnham in Surrey[2] have yielded large assemblages and have thrown light on the mode of life of the inhabitants. All these industries, which produced *tranchets* and numerous non-geometric microliths, represent a development at least in part synchronous with the Continental Late Tardenoisian, and contemporary with that of the English late Mesolithic microlithic facies, which is characterized by its geometric industries and rare inclusion of *tranchet* forms. The presence of these in the shape of picks, axes, or adzes, as at a few sites in Wales, suggests coastal movements of population.[3] In addition to these heavy flaked tools, crude perforated stone hammers were manufactured to deal with the forests.

On the one hand, flaked flint axes or picks reported from the surface of the Early Post-Glacial raised beach at Silloth, Cumberland,[4] may point to an extension of a coastwise migration in the west. On the other hand, it raises the possibilities of the Tyne Gap as a route by which Baltic Forest culture elements passed from the basin of the North Sea into that of the Irish Sea during the Atlantic climatic phase.[5]

(D) SURVIVALS OF BALTIC FOREST CULTURE TRADITIONS. Like those of other Mesolithic cultures, the traditions of the Maglemosean long survived. This is not surprising, since this greatest of the forest cultures had spread during the Early Post-Glacial period of emergence over the almost unbroken European plain, from Esthonia and Poland in the east to Britain in the west.

From the Baltic area to northern France, certainly as far west as the estuary of the Seine, Forest culture influences are expressed in more than the antler and bone implements of Maglemosean type mentioned above. While these are presumably assignable to the Boreal climatic phase, yet antler and bone objects made in Baltic style had a long vogue, and their range, as will be shown in the following chapters, extended to the extremes of the British Isles.

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[1] Clark, 1932, pp. 77–78.

[2] Clark and Rankine, 1939.

[3] Grimes, 1939, pp. 13–15.

[4] Dixon, Madden, Trotter, Hollingworth, and Tonks, 1926, p. 79.

[5] Below, p. 158. Mr. George Gray, Curator of the Carlisle Museum, where the specimens were said to be preserved, informed me that he had unfortunately no knowledge of them.

On the Continent, in the Channel basin, developments parallel to and contemporary with the growth of the *tranchet* and non-geometric microlithic industries of south-eastern Britain appear in arrays of *tranchet* axes, adzes, and picks in prolific flint, chert, and grit industries In these assemblages, as in those of the Ertebølle culture along the Litorina Sea, is seen the tendency in the microlithic element to the production of the trapezoidal *petit tranchet*, and in the heavier equipment to large *tranchets* made in flakes. The Continental industries, which we have in mind in the above connexion, admit of many local variations, but do not seem to be represented very deep in the interior.[1] They extend, however, over a long period of time. Much has been written about them, but no satisfactory chronology has been established. The case of these industries becomes more complicated because of contacts with the decaying Tardenoisian and with Neolithic influences. With the latter we are not, of course, immediately concerned. It is sufficient to say that from these blendings, and from the necessities which were due to the new food-producing economy in different environments, an infinite variety of stone implements was devised, even before the ground axe was developed.

The British Isles owed something to these comprehensive Continental industries of the early Neolithic period in which there lingered traditions of the Forest cultures. This is illustrated by many flint implements, especially those found scattered over the region of the Chalk in England, east of a line from Dorset to the Yorkshire Wolds. The most significant are those derivatives of the flake *tranchet*, the 'fish-tail' scrapers, Y-shaped and many irregular forms. Although vast collections of these surface-finds have been garnered, up till now little serious notice has been taken of the curious types. This is regrettable since they certainly provide scope for study and comparisons, for instance with examples yielded by the well-documented explorations of the great flint-mines of Grime's Graves, Norfolk. In these there is an admixture of tool-forms, some of which doubtless represent an extension of the Mesolithic heritage apparent in the western European Neolithic complex, such as occur with coarse pottery in the contexts from

[1] See, for example, Goury, 1931, chapter iii.

Le Campigny near Blangy-sur-Bresle (Seine-Inférieure) in Normandy.[1] About the end of the Atlantic climatic phase, or the beginning of the Sub-Boreal, impulses of these industries reached the peripheral region of north-western Europe, with which area this book is mostly concerned. This is revealed in assemblages of stone artifacts, which were among the direct successors of the earliest known industries of man in the cultural province embracing north-east Ireland and south-west Scotland (Chapter VIII, sections 1–4).

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[1] Salmon, du Mesnil, and Capitan, 1898; de Morgan, 1921, p. 82.

V

MAN WITH MESOLITHIC CULTURE ARRIVES IN SCOTLAND

1. INTRODUCTION

IN the preceding pages several references have been made to the earliest undisputed relics of man in Scotland. This chapter deals with the vestiges from the south-western part of the country, where the first unambiguous indications of settlement appear. We have to consider how these remains, which are all associated with Early Post-Glacial marine deposits, can be linked with the Mesolithic facies already traced northwards in England.

2. MIGRATION INTO IRELAND FROM THE ENGLISH MIDLANDS

Descendants of Upper Palaeolithic hunters migrated north-west from a centre in England, probably about the same time as visitants occupied the Victoria Cave, Settle (pp. 96–99), and before Tardenoisian strains intruded upon the surviving Creswellian. Waves of the first migrants reached the extended coastal tracts of Ireland by way of the land-connexions made available by the emergence of the sea-floor during the Boreal climatic phase. Proof that some of these people penetrated inland is furnished by a flint industry found with the bones of red deer on an old land-surface under forest peat on the north-western shore of Lough Neagh at Toome, Co. Antrim.[1] Since the sealing vegetable layer has been ascertained by pollen-analysis to be of Late Boreal age, i.e. the lower part of Zone V *b* in Ireland,[2] this lacustrine station antedates the transgression of the Early Post-Glacial sea.[3]

The aspect of the Toome industry (Fig. 47), which is the earliest unambiguous pointer to man's presence in Ireland, is predominantly that of the English late Upper Palaeolithic (Creswellian). Quite free from any Tardenoisian or Baltic influences, the assemblage, which includes hammerstones, preserves the Aurignacian tradition in its small, unrolled, sharp-

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[1] Whelan, 1930; 1933, p. 150.

[2] Erdtman, 1932, p. 106.

[3] Movius, 1942, pp. 118–19; below, p. 130.

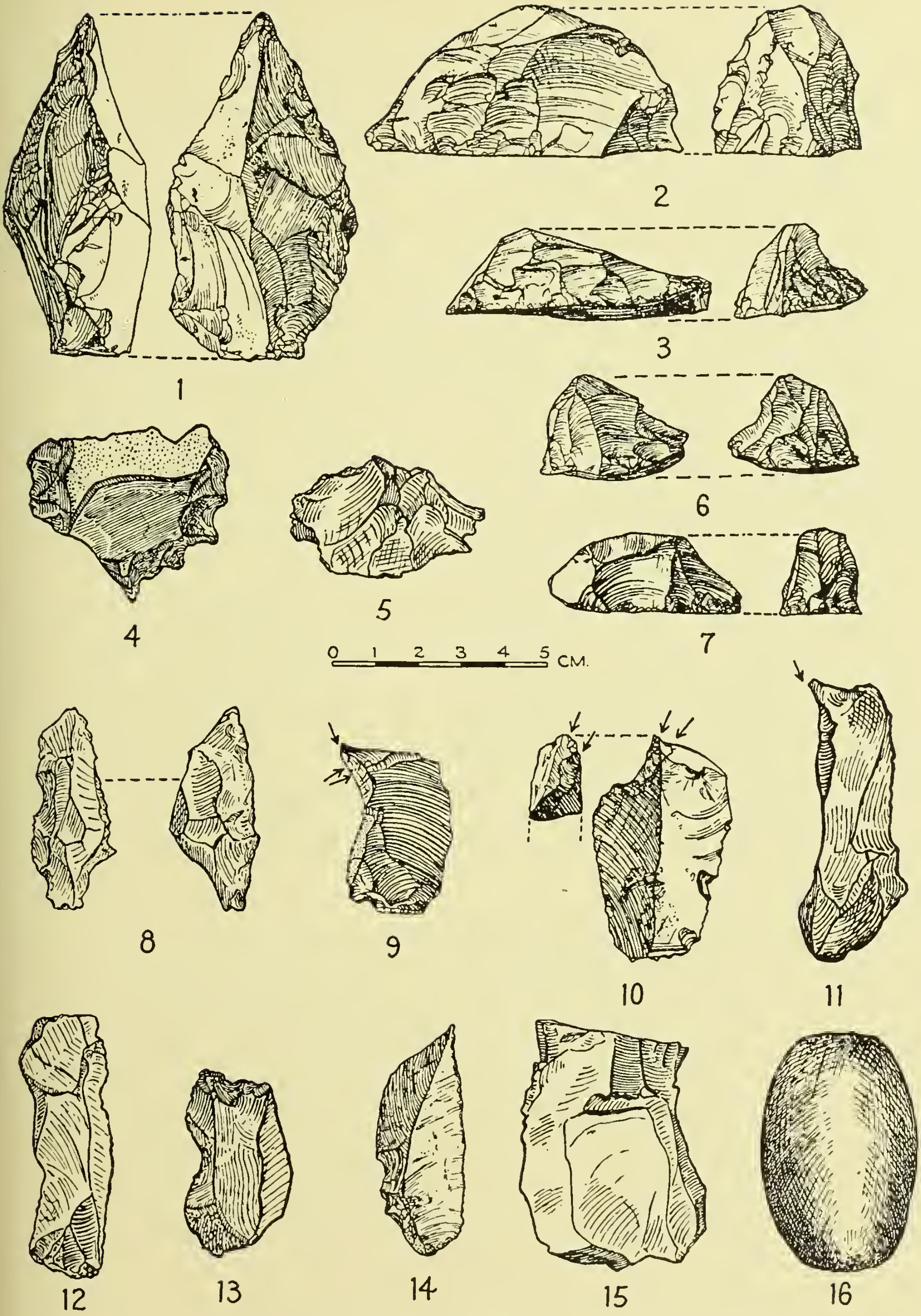

Fig. 47. Flint industry from below Late Boreal peat on the north-western shore of Lough Neagh, Co. Antrim. (After Whelan, 1933 (*a*), from Movius, 1942.)

edged picks, cores, steep scrapers, gravers, utilized blades, end-of-blade scrapers, and perforators.

3. THE LARNIAN CULTURE OF NORTH-EAST IRELAND

So far, Toome stands alone in Ireland as an inland early Mesolithic site. There is, however, satisfactory evidence of contemporary occupation along the maritime tracts and estuaries. The traces of the colonists who encamped there have been reported from Carlingford Lough, in Co. Louth, northward to the mouth of the Lower Bann River, Co. Londonderry.[1] The principal area of settlement lay in Down and Antrim, where there existed almost inexhaustible supplies of excellent flint. In this region the Mesolithic folk added to a basically Upper Palaeolithic hunting equipment several tool-forms devised in response to an environment outside the hinterland of developing forests. Their culture, represented by prolific stone industries, for long grew independently. It has been called *Larnian* because its typical evolved forms abound at Curran Point, Larne.[2] A provincial and true Mesolithic culture is connoted by this term. An early and a late facies have been recognized in its flint-work recovered from Early Post-Glacial littoral deposits. Nothing certain is as yet known of subsequent Mesolithic developments along the Irish coast. Locally, however, there is evidence, in the humus overlying the Early Post-Glacial raised beach, that many foreign cultural elements reached north-east Ireland towards the end of the Atlantic and the beginning of the Sub-Boreal climatic phase (below, pp. 246–9). With these we are not in the meantime concerned.

(A) STRATIGRAPHY

(i) Before the typology of the Larnian is considered, account has to be taken of the stratigraphy of this Mesolithic culture in north-east Ireland. This has recently been established by systematic excavations: in Co. Antrim at Cushendun, Glenarm, Island Magee, and Curran Point, Larne; in Co. Down at Rough Island, Strangford Lough. The geological, botanical, faunal, and archaeological findings have been linked with the records accumulated over eight decades and fitted into the framework of a complete section produced over fifty years ago.[3] Tribute has to be paid here to all those who have laboured so diligently in this region, and acknowledgement expressed to those authors whose works have been freely drawn upon in the compilation of these sections on the Larnian culture of north-east Ireland.

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[1] Movius, 1942, pp. 124–6.

[2] Idem, 1940(*a*), p. 75.

[3] Praeger, 1892, p. 213; 1896, p. 43.

Since the Late-Glacial and Early Post-Glacial history of north-east Ireland and that of south-west Scotland are so intimately bound up, the sequence of littoral deposits is in the main similar in both regions, and resembles that of the greater estuaries of the North Sea basin. In Ireland, as in Scotland, local conditions have governed deposition. Hence, over a long stretch of coast, notched with bays, inlets, and the mouths of glens, there are such differences as the absence or presence of some sediments. The following synthesis (in ascending order) provides the basis for the Mesolithic sequence in Ulster, and serves for comparison and correlation with the industries associated with Scottish Early Post-Glacial deposits. The accompanying drawing (Fig. 48, p. 128), which shows this ideal series for north-east Ireland, should be compared with Figs. 26, 27, and 29 showing the record revealed in the Scottish estuaries.

1. BOULDER CLAY. Attributed to the last important advance of the Scottish ice over the region. It is charged with pebbles of flint and other materials, striated, split, flaked, and bruised in transport. These carry a warning, for some inquirers have published examples as palaeoliths. A few would even attribute specimens to the artifice of man in a so-called pre-Palaeolithic stage of cultural development.[1] Nor is it surprising that many of these injured stones parallel the Sub-Crag rostro-carinate 'implements' of East Anglia, since their profuse scars were produced in very similar conditions by natural agencies, for instance concussion and pressure in carriage.

2. LAMINATED CLAY. Laid down in extra-glacial lakes dammed by packed melting ice. It occurs only in a few bays along the coast. Certain Late-Glacial outwash sands belong to this series, to which may also be referred the surface eventually occupied by man at Toome during the Boreal climatic phase (p. 124).

3. RE-SORTED BOULDER CLAY. Probably a land-surface formed during an erosion cycle after the retreat of the ice.

4. MARINE SANDS AND GRAVELS. Containing a few worn foraminifera. They were probably laid down by the high-level Late-Glacial sea, the correlative of the Yoldia Sea in the Baltic area (pp. 39, 58).

5. SUBMERGED PEAT. Dark brown in colour, and tightly compressed.

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[1] Also flint pebbles in the Wigtownshire drifts: Lacaille, 1945, pp. 84 ff.

This indicator of the Early Post-Glacial emergence has been proved in north-east Ireland to a depth of 31 feet below high-water level. Its thickness is known to vary from 6 inches to 3 feet. The bed is assignable by pollen-analysis to the Late Boreal climatic phase or the Boreal–Atlantic transition (the lower part of Zone V*b* of Ireland), on the score of a maximum of hazel in addition to birch, pine, willow, alder, oak, and elm. Besides the

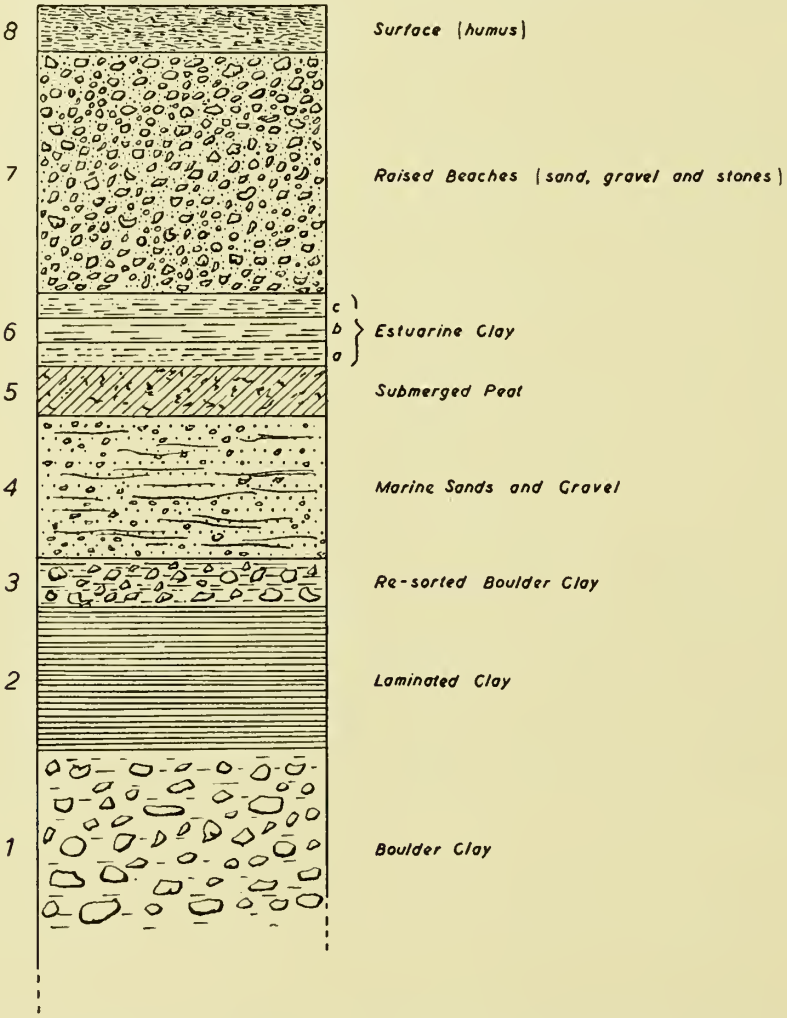

FIG. 48. Ideal section through coastal deposits in north-east Ireland, showing sequence from Late-Glacial to Post-Glacial. (Based on Praeger, 1892, 1896, and Movius, 1942.)

remains of such marsh plants as sedges, flags, and rushes, it contains the wing-cases of beetles and the bones of giant deer, red deer, and wild boar.

6. ESTUARINE CLAY. Replaced in certain localities by silts, gravels, and sands, all laid down during the transgression of the Early Post-Glacial sea. There are three zones of clay: (*a*) The Lower or *Scrobicularia* Zone, a brownish-blue, somewhat sandy deposit containing shells of species living under conditions similar to the present. Assignable to the first phase of the submergence, it is of full Early Atlantic age (entirely Irish Zone V*b*). Early Larnian implements occur in this deposit and its equivalents. (*b*) The Intermediate Zone, of light blue colour, and rich in the remains of a marine fauna, including forms no longer inhabiting these northern seas. This deposit and the corresponding beds of Late Atlantic age (the beginning of Zone VI of Ireland) yield Late Larnian products. (*c*) The Upper *Thracia* Zone resembles the intermediate clay in appearance. Its varied content of warm foraminifera and molluscan shells shows that it was deposited during the maximum of the Early Post-Glacial submergence and climatic optimum. This formation and its equivalents of Late Atlantic age (the middle part of Zone VI of Ireland) are rich in Late Larnian material.

7. RAISED BEACHES. These conspicuous littoral features are composed of sand, gravel, and stones, particularly heavy materials being built up into the storm beaches along the less sheltered parts of the coast. Formed partly during the transgression and partly during the regression of the Early Post-Glacial sea, they are referable to Late Atlantic–Early Sub-Boreal times (Zone VI of Ireland). In Northern Ireland their height varies from 10 to 30 feet above sea-level. Locally they are studded with sea-worn rocks and backed by an indented and cave-perforated cliff. Abraded and heavily rolled Late Larnian artifacts are the typical archaeological ingredients of the raised beaches. These formations often rest upon deposits older than the deep-water clays or their correlative silts, sands, and gravels.

8. SURFACE. Recent humus accumulated mainly after the recovery of the land following the invasion of the Early Post-Glacial sea, locally containing artifacts with Early Neolithic affinities. Sometimes these are mixed with Larnian implements derived from the subjacent beach. At many points along the coast later surface accumulations and antiquities combine with the humus. In places, also, the beach is topped by sand-dunes abounding in relics of man.

(ii) The length of occupation varied at coastal stations. This is shown by the facies of the artifacts recovered at the excavated sites. The following summary, which gives the archaeological horizons and the nature of the implementiferous deposits, brings out this point:[1]

(A) EARLY LARNIAN

Cushendun: Horizon 1 (Deposit E), Lower Lagoon Silt [= 6 (*a*) (early) above]; Horizon 2 (Deposit D), Lower Gravel [= 6 (*a*) (somewhat later?) above].

Island Magee: Horizon 1 (Deposits D–G), alternating layers of gravel and sand [= 6 above].

Rough Island: Horizon 1 (Deposit B), coarse sand and gravel (Raised Beach) [= 7 above].

(B) LATE LARNIAN

Cushendun: Horizon 3 (Deposit B), Upper Gravel (Raised Beaches) [= 7 above].

Island Magee: Horizon 2 (Deposit C), Estuarine Clay [= 6 (*c*) above]; Horizon 3 (Deposit A), Raised Beach [= 7 above].

Glenarm: Horizon 1 (Deposit B), Raised Beach [= 7 above].

Larne, Curran Point: (Deposits G–D), sand series at base of gravel; (Deposit C) inclined beds of gravel and sand; (Deposit B) Storm Beach. [All = 7 above.]

(C) INDUSTRIES WITH EARLY NEOLITHIC AFFINITIES

Cushendun: Horizon 4 (Deposit A), Humus [= 8 above].

Rough Island: Horizon 2 (mixed with derived Early Larnian; Deposit A), Humus [= 8 above].

Glenarm: Horizon 2 (Deposit A), Humus [= 8 above].

(iii) The reports on the excavated coastal sites make it clear that the Larnian relics were found in secondary position,[2] having been carried by the Early Post-Glacial sea from occupation-sites on the extended maritime lowlands and foreshore and incorporated in the various formations. The Early Larnian complex, to which belongs the Toome industry found *in situ*, is referable like the latter to the Boreal climatic phase before the marine transgression; and the Late Larnian, which is by far the better represented facies, is referable to the Early Atlantic before the maximum expansion of the Early Post-Glacial sea. Therefore the Early Larnian may be said to correspond broadly to Baltic Forest Culture Period II (Maglemosean) development, and the Late Larnian to Baltic Forest Culture Period III (Ertebølle).

(B) TYPOLOGY

If, in the future, investigations are carried out in south-west Scotland with the same thoroughness which has marked researches in north-east Ireland, closer correlations may be established between the two regions than is now possible. With this in view, a rather detailed survey of the Larnian stratigraphy has been given here. For the same reason, and because of the potentialities of the Scottish coastal deposits dealt with in this book, the principal characteristics of the Larnian output will now be discussed.

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[1] Movius, 1942, p. 148.

[2] Ibid., p. 146.

1. EARLY LARNIAN. Most Early Larnian artifacts are unscathed though patinated. Their surface change varies according to the containing deposit, from dull black, blue, and brown to a cream and chalk-white porcellanous coating. Sometimes they bear ferruginous stains and rust-like adhesions, due probably to the action of land-springs discharged across the foreshore.[1] None of these alterations, however, is a sure guide to age, since with rare exceptions *Late* Larnian flints are as deeply patinated as their precursors, and very many are abraded, heavily rolled, and have dulled edges.

Though Early Larnian settlements were assuredly scattered over the land surface recovered from the sea during the emergence of Boreal times, yet the only surviving remains of this complex were derived from stations at the mouths of rivers or in the track of longshore currents.[2] It is to these factors, and to the rapidity with which in Early Atlantic times the rising sea encroached upon the land, carrying materials and laying these down in successive and protective layers, that so many products of Early Larnian industry retain their pristine angularity and sharpness.

Besides providing the key to the archaeological sequence of the littoral deposits of north-east Ireland, Cushendun, in Antrim, is the type-site of the Early Larnian. The products of this facies fall under the following headings (Fig. 49):

Flakes and blades, as in Upper Palaeolithic industries, form the bulk of the Early Larnian output. Struck from well-prepared cores, they vary greatly in shape, and in length range from 3 to 10 cm., the average being 6 cm. The edges of most are injured from use as knives, scrapers, and points (flakes, nos. 1 and 2, and blades, nos. 4–6). Edge-retouched specimens, however, are present (e.g. nos. 3, 7, and 8). Among these, evidently intended for arming hafted weapons, the best defined are leaf-shaped, their butts being reduced in width and thickness by chipping (e.g. no. 8).

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[1] Warren, 1934, p. 108.

[2] Movius, 1942, p. 149.

Steeply dressed blade-implements have been found only at Cushendun, Co. Antrim, and Rough Island, Co. Down. Since these sites lie so far apart, it may be that these types are fairly well distributed at intermediate points along this coast. As regards shape and treatment, the examples illustrated follow Upper Palaeolithic tradition (nos. 9 and 10).

End-scrapers trimmed on rough flakes are present (nos. 11 and 12). Examples made on blades, however, have not so far been recovered in north-east Ireland.

Side-scrapers are not common. The recognizable forms are made in thick flakes (no. 13), which are the basis also of a few scraping-tools, combining more than one retouched working-edge (no. 14).

Thumb-nail scrapers, often of irregular outline and worked on portions of fairly thick flakes, make up for the apparent lack of more familiar scraper types (nos. 15 and 16).

Hollow-scrapers, with a small working-notch worn or practised in the side or end of the parent blade or flake, form quite a considerable element of the Early Larnian equipment (nos. 17 and 18).

Perforators or awls, shaped by retouch in small flakes, are fairly common (no. 19).

Cores are, of course, extremely numerous as the waste of flake and blade industries. Most are of the plain single-platform type (nos. 20–22). This reflects the abundance of good native flint in Antrim and Down.

Core-scrapers, if not as common in the Early Larnian industries as in the Upper Palaeolithic, are yet well represented by types with inclined and vertical faces (no. 21).

Steep scrapers, made in thick flakes, resemble the core-scrapers in form and treatment (no. 23).

Picks are peculiar growths of the Early Larnian. The simplest, the Larne pick (no. 24), attains its full development as the type-implement of Late Larnian industry (p. 136). Normally consisting of a plunging flake with narrow butt, it often retains the natural crust at the wider end. Wear and retouches indicate use of the bulbar end. It has been suggested that this form is related to the Asturian pick.[1] The Iberian tool, however, is made in a pebble, whereas the Irish form is essentially a flake-implement and has to be regarded as a local specialization.[2] Moreover, no signs of Asturian

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[1] Whelan, 1930, p. 184.

[2] Movius, 1937, p. 196.

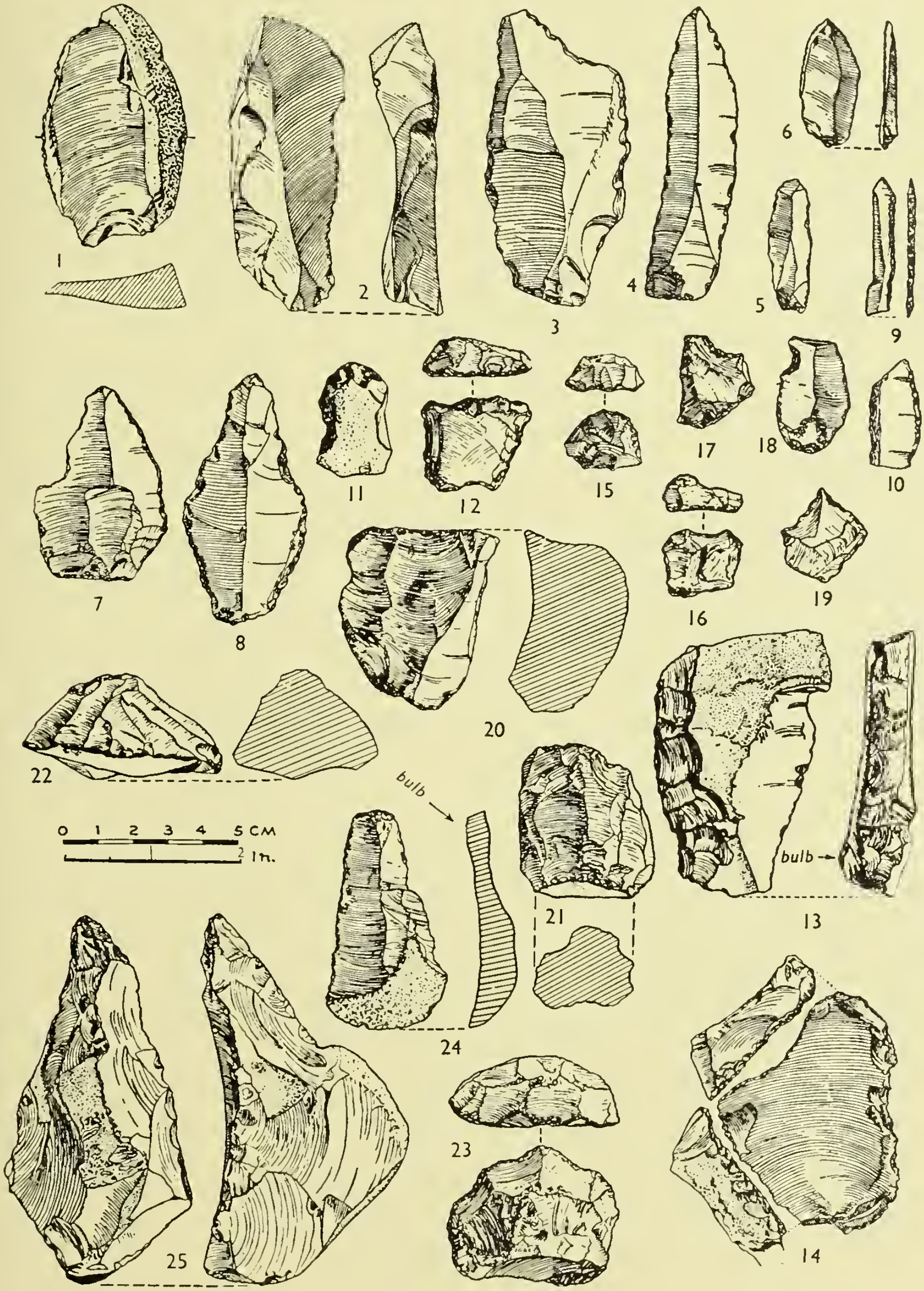

FIG. 49. Early Larnian flints from north-east Ireland. Nos. 1, 2, 6, 14, Island Magee (after Burchell, 1934); nos. 3, 8, 13, 22–23, Cushendun (after Movius, 1940 (*a*)); nos. 5, 7, 9, 12, 15–21, 24, 25, Rough Island (after Movius, 1940 (*b*)).

Mesolithic influences have been detected in Britain.[1] The other pointed tool evolved in Early Larnian industries is the Cushendun pick, so called after the place where the best examples are found. Typically a rostro-carinate implement, it must not be confused with, or considered to be a descendant of, the Sub-Crag objects, believed by some to be the tools of 'Pliocene Man', or even as of a Lower Palaeolithic ancestry. This form, which admits a few variants, usually retains much of the cortex, despite preparation by flaking and chipping to form its cutting-edges, beak-like working-end, and convenient thick grip (no. 25).

2. LATE LARNIAN. In contradistinction to the Early Larnian which was developed during the emergence of the sea-floors, the Late Larnian was evolved at sites occupied on the foreshore during the early phase of the subsequent marine transgression, or as the land sank in relation to the sea. The industrial remains of the evolved facies were generally long subjected, therefore, to considerable wave action before they were incorporated into the storm beaches formed when erosion became less active and deposition began after the maximum of submergence. Hence Late Larnian implements from encampments farthest from the containing deposit would undergo most ill-treatment by wave-tossing and rubbing. Naturally the coarsest forms suffered most, for, being too heavy to be transported, they had to be rolled along the bottom until they were incorporated in the storm beach when wave action was severe. Their rarity in sand indicates sorting in the beds.

Several archaeologists have failed to allow for the destructive part played by the waves, and have assigned abraded Mesolithic material from the littoral deposits of north-east Ireland to Palaeolithic cultures, Upper, Middle, and even Lower. How so many of these relics came to be injured can be seen along many exposed parts of our coasts, where great pebble beaches are in course of being built by strong seas. Such fresh-looking Late Larnian implements as occur are mainly those manufactured and lost upon the beach during its formation. We must also remember that the nature of the deposit is a relevant factor. Thus Late Larnian implements from the estuarine clay at Island Magee (Deposit C) are fresh compared with those from the overlying beach (Deposit A).[2]

As is pointed out in the standard work on the Irish Stone Age,[3] difficulties arise in assessing Late Larnian products because local conditions controlled deposition, and also because we have to distinguish variations which are due to local development and natural sorting by the sea. This fact, together with the bad state of so much of the material, does not simplify identification. Moreover, since so few Irish Late Larnian industries have been recorded as found *in situ*, nothing certain can as yet be said of Mesolithic developments in north-east Ireland after Early Atlantic times. However, a sterile kitchen-midden referable to the Late Atlantic climatic phase at Rough Island, Co. Down, and another, which has yielded a small and manifestly late industry, both suggest that undisturbed Late Larnian settlements probably exist above the line that denotes the maximum of the Early Post-Glacial sea.[1] Still, from the great quantities of derived artifacts recovered from comparable deposits in Antrim and Down, it is possible to separate several main groups of implements without going over the detailed studies which have been made of vast collections.

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[1] Burkitt, 1932; Movius, 1942, pp. 205–6.

[2] Movius, 1942, p. 159.

[3] Ibid., p. 159.

The Late Larnian is, of course, a development from the early facies. The production of heavy unspecialized implements, and the use of flakes rather than blades in its industry, mark the breakdown of Upper Palaeolithic tradition in north-east Ireland. These features reflect also the changing environment, due to the dominance of the sea instead of the land, and the increase of forests with the approach of the climatic optimum.

The degeneration from the Upper Palaeolithic standards surviving in the Early Larnian industries is seen in the usually thick and poorly prepared Late Larnian flakes and blades (Fig. 50). Few are retouched, but as in the older groups many exhibit signs of use along the edges. In the Late Larnian, however, it is often difficult to distinguish wear from damage. It is a peculiar characteristic of this complex that the dressing in flake-implements often appears on the underside or bulbar face (e.g. no. 12). Flakes, large and small, showing traces of utilization as knives or side-scrapers (e.g. nos. 1–3), are numerically the best-represented tools. Among these are examples used as end-scrapers (e.g. no. 2) and hollow-scrapers (e.g. nos. 3 and 4).

How the Late Larnian blades compare with the flakes appears in Fig. 50 (nos. 1–4). The drawings show also how these varied objects diverge from the delicate Early Larnian products (cf. e.g. Fig. 49, nos. 3–6).

Points, dressed at the butt to a sort of tang (Fig. 50, nos. 5 and 6), are an important element in Late Larnian assemblages. They seem to be a development between the edge-retouched leaf-shaped implements with narrowed butts of the Early Larnian and an evolved type (Early Neolithic) current in Northern Ireland (below, p. 251). A few fully-tanged points fashioned in rather large flakes (e.g. no. 7) strengthen this tool class in the Late Larnian industry of Island Magee.

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[1] Movius, 1940(*b*), pp. 121, 134.

Retouched scrapers are found. Steep end-of-flake with straight working edge (no. 8), discoidal (no. 9), and thumb-nail (no. 10), are the principal forms. True side-scrapers are uncommon (e.g. no. 11), but generalized tools with more than one working-edge and hollow-scrapers are fairly frequent. The trimming is usually crude.

Perforators are present, often in combination with notches for use as hollow-scrapers (no. 12). Small specimens seem to be most characteristic of the Late Larnian.

Choppers, roughly worked by bold percussion-retouch on flakes and cores, constitute a large part of the Late Larnian industrial output. Those made on flakes often incorporate concave and convex working-edges (e.g. no. 13).

Larne picks, heralded in the Early Larnian, commonly appear as predetermined, and sometimes well-retouched, tools in the Late Larnian of Larne and Island Magee (no. 14). As already mentioned (p. 132), they typify the developed Mesolithic industry of north-east Ireland. The basic flakes show the skill of the craftsmen, who, from nodules and cores, could so ably strike off plunging flakes, with thick but narrow striking-platforms opposed by a wide end.

Axes and adzes made in flakes occur sporadically. They are highly important and characteristic components of the Late Larnian equipment. Varied in shape, the 'Larne axes' are finely flaked, usually all over their surfaces (e.g. nos. 15 and 16). A few examples, similarly treated in cores, exhibit the typical terminal sharpening scar of the *tranchet* below (no. 16). This significant feature demonstrates that influences of the industry of the Baltic Forest culture had penetrated into north-east Ireland fairly early in Atlantic times. That they reached this region from Scotland rather than England is strongly suggested by the artifact evidence put forward later (pp. 149, 165–7).

These flaked cutting-tools are the only pointers so far to the infiltration of influences from outside. Otherwise, the Late Larnian industry is entirely a development peculiar to the coastal stretch of north-east Ireland. It was

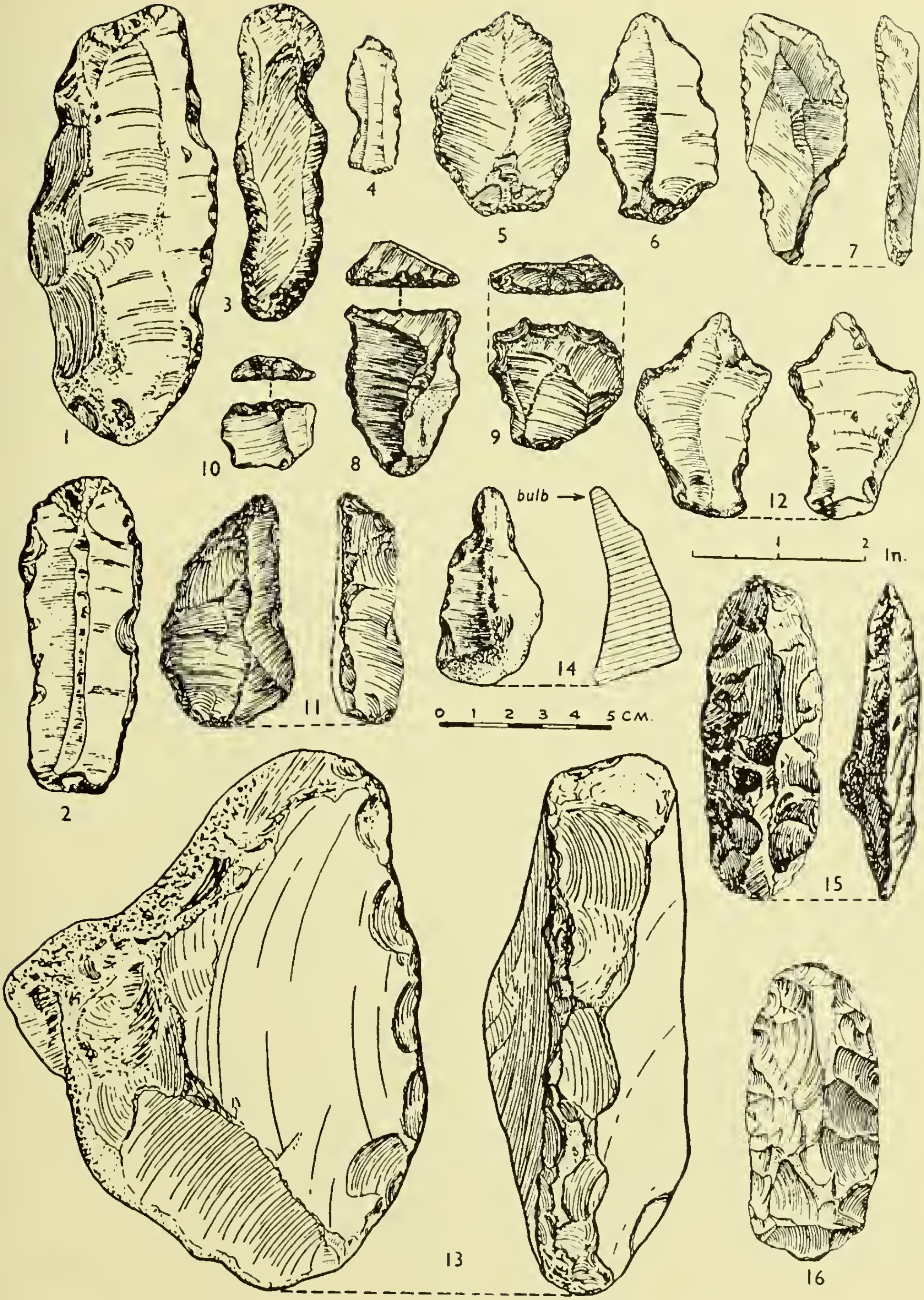

FIG. 50. Late Larnian flints from north-east Ireland. Nos. 1–4, Cushendun (after Movius, 1940(*a*)); nos. 5, 8–12, Glenarm (after Movius, 1937); nos. 6, 13–14, Larne (after Movius, 1942); no. 7, Larne (after Burchell, 1934, and Movius, 1942); no. 15, Larne (after Coffey and Praeger, 1904); no. 16 (after Whelan, 1938, and Movius, 1942).

evolved by settlers who were gradually forced by the encroachments of the Early Post-Glacial sea to abandon their occupation-sites along the maritime tracts, and who were compelled to adapt their equipment to the needs of new surroundings.

We must not overlook the record of flaked axes from the surface of the Early Post-Glacial raised beach in Cumberland, as this may suggest the possibility that Baltic strains reached Ireland by sea from England (pp. 158–9). These implements, however, have not been traced. Conversely, as if pointing to a diffusion of industries comparable with the Late Larnian, a massive, very crudely flaked and bruised flint nodule, resembling the heavy choppers of north-east Ireland, has been found at Harrington Mill, Cumberland (Fig. 51).

The Larnian industries of north-east Ireland are known so far solely by their stone artifacts. Whereas we should certainly expect implements made in bony substances to be found in equipments in which Upper Palaeolithic traditions survive, the record is in fact extremely meagre. It comprises atypical objects cut by flint tools, prickers made in the ulnae of deer found in the forest peats of a raised beach at Holywood, Co. Down,[1] a deer antler and a rib from the estuarine clays of Belfast Lough,[2] possibly referable to the Early Larnian, and a bovine rib assignable to the Late Larnian from the raised beach gravels at Glenarm.[3] Yet the more elaborate working of bone is indicated by the presence of gravers at the inland early Mesolithic station at Toome; this form of implement is notably absent from Early and Late Larnian series from coastal sites in north-east Ireland. It is possible, of course, that conditions in the containing deposits were unfavourable to the preservation of bone.

4. DIFFUSION OF THE LARNIAN TOWARDS SCOTLAND

The diffusion of the Larnian culture beyond Ireland is proved by stone industries recovered from the Early Post-Glacial (the so-called 25-foot) raised beach of south-west Scotland. Comprehensive series have been found in the Kintyre districts of Argyll and in the Carrick division of Ayrshire (see map, Fig. 58), neither region being more than twenty-five miles from the Ulster coast. Some of their components may well go back to Boreal times, the North Channel then being narrower than it is today, and south-

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[1] Holme, 1912.
[2] Young, 1877, p. 19.
[3] Movius, 1937, p. 198.

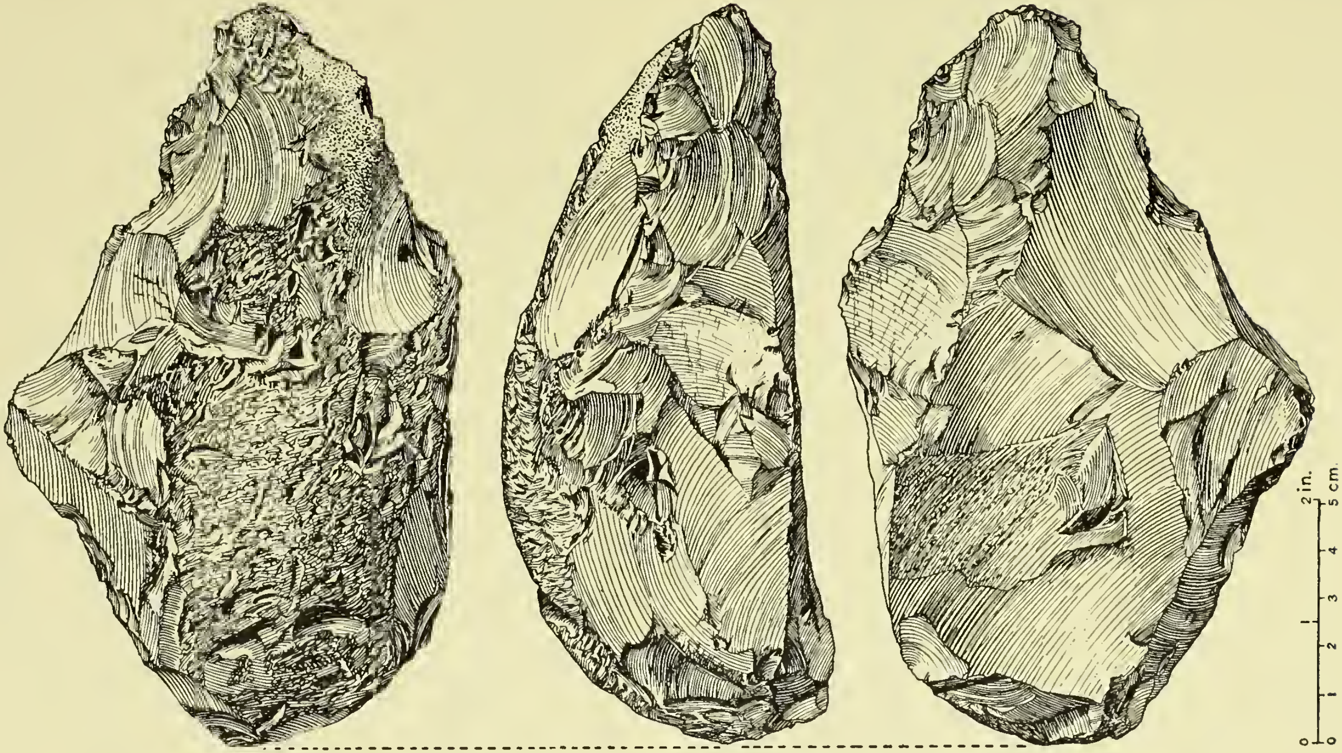


Fig. 51. Massive flint chopper from Harrington Mill, Cumberland.

west Scotland certainly as habitable as north-east Ireland. It is thought, however, that most of the relics so far found stratified in south-west Scotland are referable to an early phase of the succeeding marine transgression. Like so many Larnian industrial remains from the analogous raised beach in Ulster, they would derive from sites occupied along shores which were still extended. Thence they were washed inland by the Early Post-Glacial sea and incorporated in the raised beach. Recovered deep down in deposits of Atlantic age, they furnish what is believed to be the earliest evidence of man in Scotland.

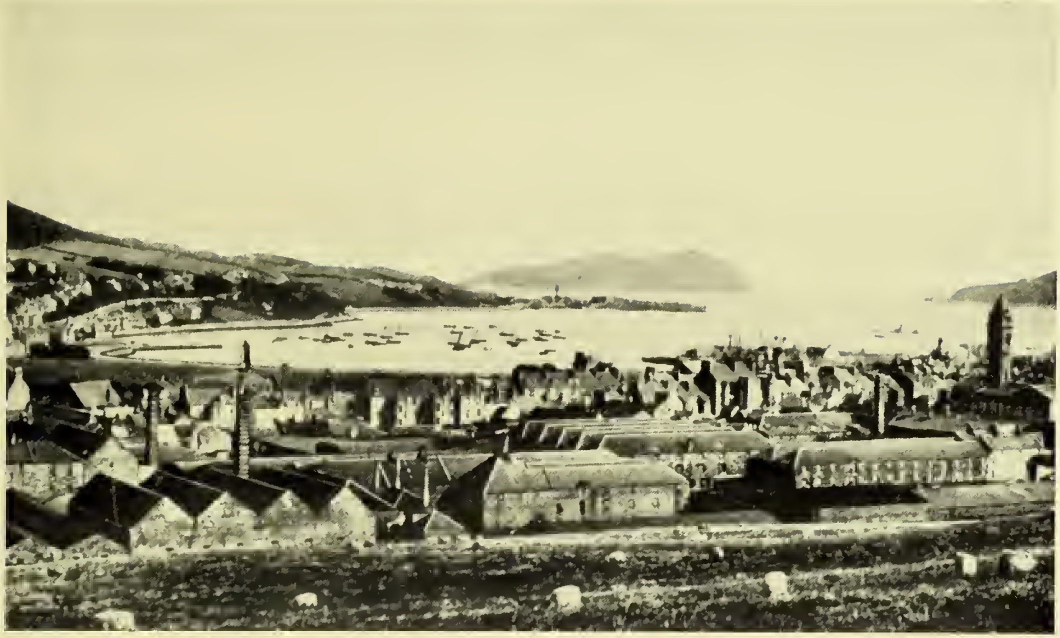
That man's colonization of Scotland should be so closely bound up with that of north-east Ireland is comprehensible when one considers the possibility of routes beyond the Creswellian outposts. The scarped, rugged, and poorly stocked district of the west Pennines offered only difficult routes to bands of ill-equipped migrants. That these conditions persisted for a long time is shown by the scarcity of prehistoric antiquities in this region. By comparison, the territory reclaimed from the Irish Sea, and the banks of the great lakes and rivers of the period of emergence, would permit of easier travel and provide abundant subsistence. It can be appreciated also how the migrating peoples changed from inland hunters to strand-loopers as they advanced in a north-westerly direction.

5. THE LARNIAN INDUSTRIES OF THE EARLY POST-GLACIAL RAISED BEACH OF SOUTH-WEST SCOTLAND

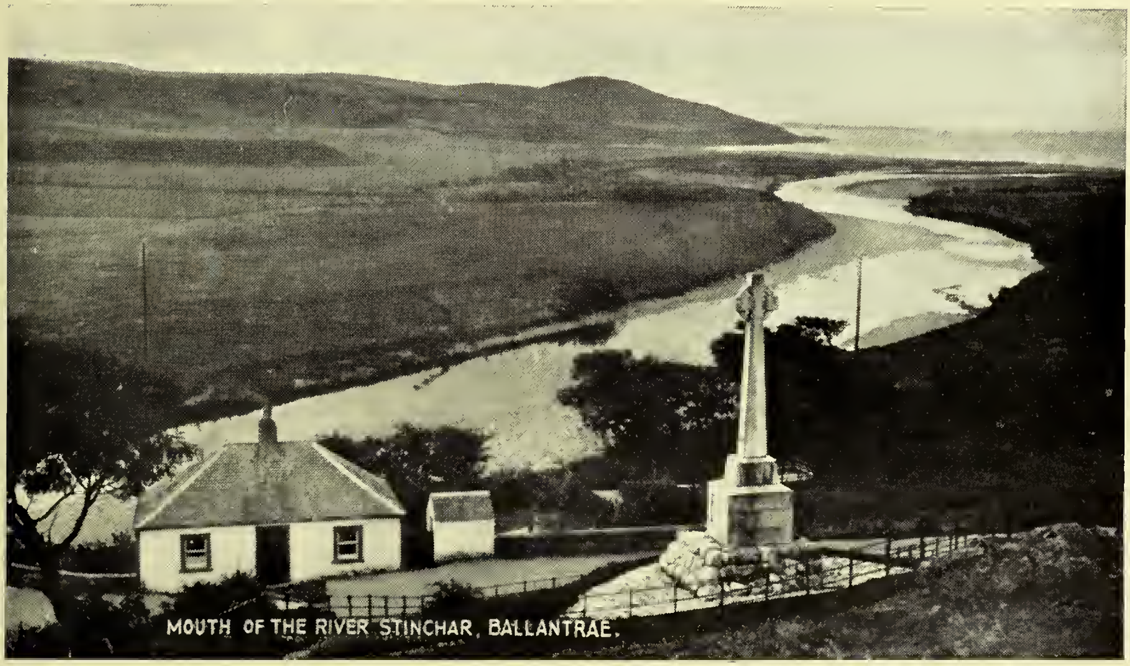
(A) CAMPBELTOWN, KINTYRE, ARGYLL

The most instructive Scottish lots of Early Larnian facies have been recorded from Campbeltown, Kintyre. Three sites, Dalaruan, Millknowe, and Albyn Distillery, all about a quarter of a mile from the sea at the head of Campbeltown Loch (Pl. IV*a*), make the locality classic (map, Fig. 52). The materials from Dalaruan and Millknowe were combined as a single collection and apportioned to the Campbeltown Museum, the National Museum of Antiquities of Scotland at Edinburgh, and the Glasgow Corporation Museum at Kelvingrove. Fortunately this fact has not been prejudicial, since the stratigraphy is identical and the facies homogeneous.

I. DALARUAN AND MILLKNOWE. Over sixty years ago, during the course of commercial diggings for gravel, some patinated flints were exposed under Bronze Age pottery and human bones. This led local



(*a*) CAMPBELTOWN LOCH, KINTYRE, ARGYLL
(*By permission of Messrs. Valentine, Dundee.*)



(*b*) MOUTH OF THE RIVER STINCHAR, BALLANTRAE, CARRICK, AYRSHIRE
(*From a photograph by A. D. Henderson, Maybole.*)

naturalists to examine the beach, and resulted in the discovery of stone industries at Dalaruan and Millknowe. In the report published in 1894[1] the height of the beach at these places was estimated as 30 feet above high-water mark. The following sections were recorded.

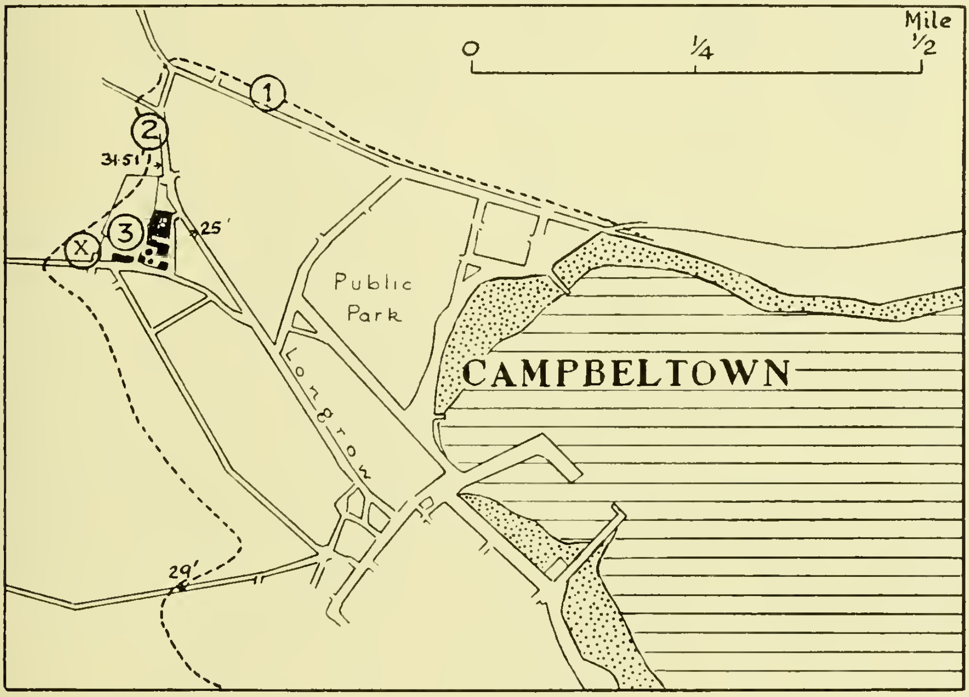


FIG. 52. Sketch-map (based on McCallien and Lacaille, 1941) showing sites in Early Post-Glacial raised beach at Campbeltown, Kintyre, Argyll: x, First discoveries; 1, Dalaruan; 2, Millknowe; 3, Albyn Distillery and Calton Housing Scheme.

(i) *Dalaruan* (from below upwards):

	Ft.	*In.*
4. Dark loamy soil	2	6
3. Sandy gravel with a few large rolled stones	2	0
2. Fine sand with occasional small rolled stones	2	2
1. Fine gritty shingle and sand	1	2
	7	10

The cutting revealed considerable false-bedding. All the artifacts occurred in the lowest stratum (1, above).

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[1] Gray, 1894.

(ii) *Millknowe* (from below upwards):

	Ft.	*In.*
4. Black loam	3	0
3. Shingle, very little sand	2	0
2. Thin dark-coloured band thinning out on both sides	0	3–6
1. Shingle	2	0
	7	6

Flints were found in great abundance from the lower part of the deep black soil downwards to a depth of 4 feet into the shingle, and about 7 feet from the land-surface. The dark-coloured band (2, above) also contained comminuted fragments of bone, a tooth of grey seal (*Halichoerus gryphus* Nils.), twigs and branches, and pieces of fractured vein-quartz with rust-red and opaque dull-white surfaces, as if severely burnt.

The Dalaruan–Millknowe industry was only briefly described by the finder. Its great interest was brought out, however, in 1922, when a selection of specimens in the National and Kelvingrove Museums was illustrated, and attention drawn to its debased Upper Palaeolithic aspect.[1] This shrewd recognition of its fundamental character was taken by some to mean that the material was of Palaeolithic age, thus adding uncalled-for problems to confusion already existing in connexion with industries associated with the Early Post-Glacial raised beach in Scotland. This interpretation was the more regrettable in that it came to be applied to comparable relics from north-east Ireland, where the resemblance between the Kintyre group and series from littoral deposits in Down and Antrim was justifiably stressed in publications. Fortunately, recent work in both Scotland and Ireland has served to correct these misapprehensions.

As the illustration (Fig. 53) shows, the Dalaruan–Millknowe series includes the principal tool-forms met with in a typical Irish Early Larnian industry. But, since picks of the Cushendun and Larne types are absent, the features which indicate the Creswellian ancestry of the Scottish assemblage stand out all the more obviously. Simple and edge-worn flakes and blades, struck from pebbles and cores, constitute the majority of relics of early Mesolithic strand-loopers (nos. 3, 6–9, 14, and 15). Their angles are sometimes battered (e.g. no. 15). A few examples are retouched into end-scrapers (e.g. no. 10). One, probably a perforator (no. 16), is worked to a small

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[1] Breuil, 1922, p. 261.

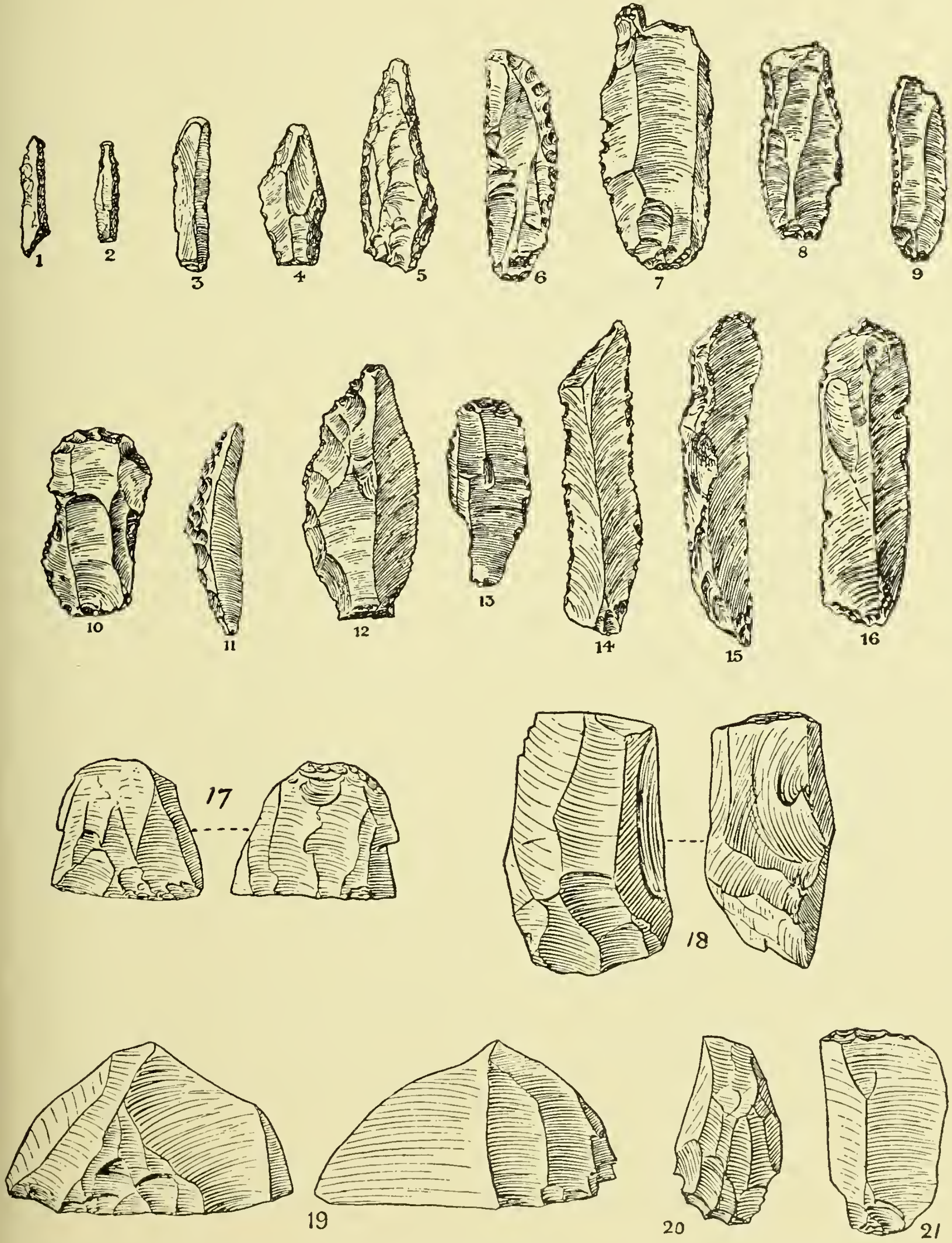

FIG. 53. Early Larnian flints from Dalaruan–Millknowe, Campbeltown. (⅔) (After Breuil, 1922, and Movius, 1942.)

medial point at the semicircular upper end. Seldom does the dressing extend to both sides or to a single edge with the other margin remaining sharp. Such lateral reworking seems to have been for removing the edge and transforming it into a back. No graver is present, but only a spall detached from one in the making (no. 11). The thick, short, and steeply edge-blunted implements (nos. 1 and 2, 4 and 5, the first sub-triangular) retain the bulb of percussion like their late Upper Palaeolithic forerunners. A leaf-shaped object with partially restricted butt is figured as representative (no. 12) of a common form. Small scaled flakes (e.g. no. 13), cores, and core-scrapers (nos. 17, 19–21) are present. A core (no. 19) has been treated by steep flaking to serve as a chopper or wedge, probably for splitting bone.

2. ALBYN DISTILLERY. (i) Ever since the Dalaruan–Millknowe collection was first recorded, searchers have recovered flints during the course of utilitarian excavations in the raised beach around Campbeltown Loch. Some have gone farther afield and have extended their searches in and upon this formation at different points on the Firths of Clyde and Solway, and islands in the west. Added incentive was given to these inquiries by a desire to link the Campbeltown flints with the industries from the caves at Oban opening on,[1] and refuse-heaps resting upon, the Early Post-Glacial raised beach in Oronsay and other islands in Argyll.[2] A still greater stimulus was provided later by the analytical report on the Dalaruan–Millknowe series,[3] and by the knowledge that the Campbeltown group included the counterparts of many forms found in equivalent deposits in Ulster. These researches in south-west Scotland, though without method, nevertheless led to the recovery from the storm beaches of numbers of deeply patinated specimens, which the author has inspected in public and private collections. Although many more may still remain in the cabinets of amateurs and in the drawers of Scottish museums, yet enough have been identified to show the significance of certain specimens. Among those to which passing references have been made in the literature, micro-burins from the Stranraer district[4] may be mentioned, and coarse rolled artifacts from several points on the coast.[5] The realization that these relics indicated

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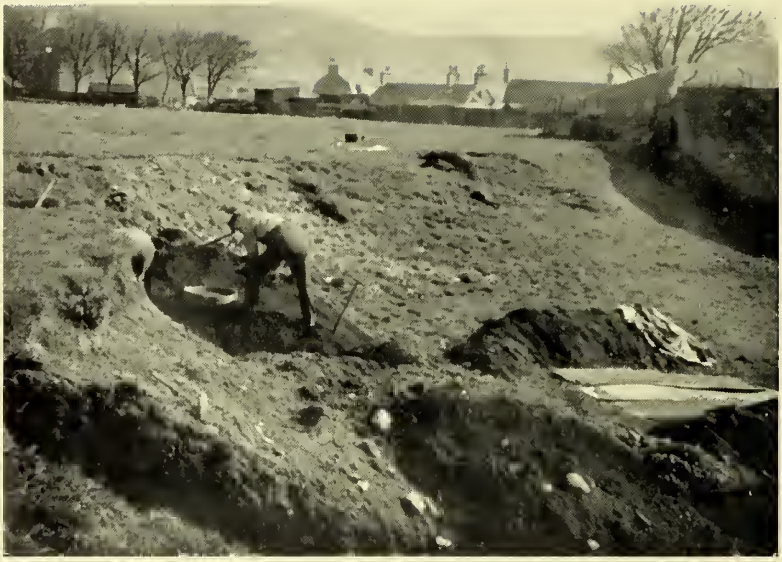
[1] Anderson, 1895; 1898.

[2] S. Grieve, 1883; 1885, pp. 47–61; 1923, pp. 14–17; Bishop, 1914.

[3] Breuil, 1922, pp. 261–5.

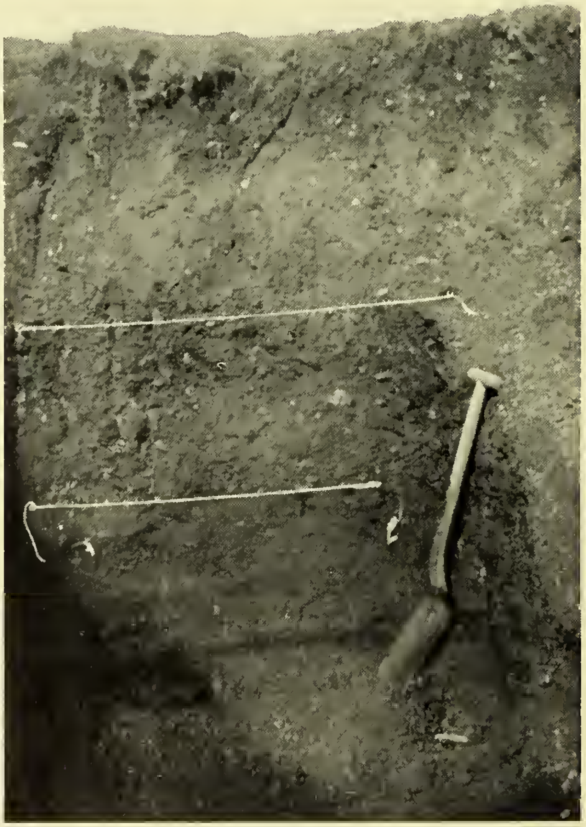
[4] Childe, 1935, p. 20.

[5] Movius, 1940, p. 20; 1942, p. 198; Lacaille, 1945, pp. 84 ff.



(*a*) GENERAL VIEW OF THE EARLY POST-GLACIAL RAISED BEACH, ALBYN DISTILLERY, CAMPBELTOWN

(*From a photograph by W. J. McCallien* (*McCallien and Lacaille*, 1941).)



(*b*) TRENCH IN EARLY POST-GLACIAL RAISED BEACH, ALBYN DISTILLERY, CAMPBELTOWN. MAIN IMPLEMENTIFEROUS LEVEL BETWEEN THE STRINGS.

(*From a photograph by W. J. McCallien* (*McCallien and Lacaille*, 1941).)

further exploration of the archaeological possibilities of the Early Post-Glacial raised beach led to more serious investigations. These have taken the form of excavations, examination of sections, and the study of materials and relics from the Scottish and Irish sides of the North Channel. It goes without saying that they were prompted in great measure by the brilliant work done in north-east Ireland, where it was recognized that the key had been found to a Mesolithic cultural sequence which also involved Scotland.

(ii) As it was felt that with this knowledge a more typical series might be found at Campbeltown, a site for excavation was selected near the Albyn Distillery (Pl. V *a*), about a quarter of a mile from the Dalaruan and Millknowe sites.[1] The unexpected features present in the full collection recovered in 1935 throw considerable light on Early Mesolithic developments in Scotland.

The height of the raised beach was measured as 32 feet 2 inches above O.D. at the place where the trenches were dug. The beach, however, extends farther inland and rises much higher,[2] probably to about 40 feet.[3] Its composition (from below upwards) is shown by the following section exposed in the main trench (Pl. V *b*):

	Ft.	*In.*	
4. Dark soil	1	8	
3. Brown soil, re-sorted boulder clay . . .	3	4	
2. Dark layer rich in flints	3	7	
1. Gravel and sand in thin beds to	7	0	(base not reached)

The re-sorted boulder clay (no. 3) is probably a slope-wash carried from a glacial deposit by floods during the rainy Atlantic climatic phase.

Most of the archaeological remains were obtained from the 3-inch dark layer (no. 2) and the topmost part of the underlying gravels. A few were taken from the overlying soil. An impersistent, thin, dark, implementiferous seam, at a depth of 18 inches below no. 2 bed, appeared to be similar to seams described and interpreted in 1894 as the vestiges of a working-surface.[4]

Of the 1,235 objects from the excavations now preserved in the Hunterian Museum at Glasgow University, 956 are flint, 271 quartz, and 8 of schistose grit. This recognition of artificially struck stone other than flint, and the subsequent discoveries of artifacts made in these materials, lead to the inference that many Mesolithic relics must have been lost in the past owing to the inability of collectors to detect the signs of workmanship in these native stones.

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[1] McCallien and Lacaille, 1941.

[2] Gray, 1894, p. 263.

[3] McCallien and Lacaille, 1941, p. 60.

[4] Gray, 1894, p. 270.

Virtually all the artifacts are undamaged, their edges being sharp and angular. The rolled condition of a few, however, indicates a fair amount of wave action before they finally came to rest. Yet no typological difference can be detected between these and the unscathed artifacts. The ingredients of the collection exhibit varying degrees of white patination, mostly creamy or dull porcellanous. Some bear these reddish-brown stains and adhesions of 'iron-pan' that appear commonly on artifacts from the stratified and highly ferruginous gravel overlying the Lower Lagoon Silt at Cushendun.[1] Several specimens are fire-crackled.

The Albyn Distillery collection contains all the forms which lend a debased Upper Palaeolithic aspect to the Early Larnian series from Dalaruan, Millknowe, and Ulster. It includes a number of specialized tools such as occur in north-east Ireland, but not in the Dalaruan–Millknowe assemblage. And, since the series also includes types which are lacking in the Early Larnian industries of the neighbouring and Irish sites, it is very important in any study of the archaeology of Scotland and north-east Ireland. The selection figured here (Fig. 54) is drawn from the illustrations in the detailed report of the excavation.[2]

The Albyn Distillery group, like that of Dalaruan–Millknowe, betrays a freer use of plain flakes than of blades. This reflects the scarcity of tractable stone and the economical employment of material by the settlers around Campbeltown Loch. These essential elements of the industry range from 1 to 6·5 cm. in length, most being between 1·5 and 2·5 cm. and narrow.

Primary flakes (e.g. no. 1), retaining the cortex of the parent flint pebble, are very common. Blades are varied, and most have not been retouched. Whether trimmed or not, most are worn along the edges. Parallel-sided examples are the most frequent: e.g. nos. 2, 3, and 6 (flint), and no. 4 (quartz), all plain; and no. 8 (flint), carefully retouched. Crude leaf-shaped specimens are represented by no. 5 (schistose grit) reduced in thickness at the butt, and no. 7 (flint), finely treated along the edges.

Small, steeply edge-dressed implements are of two kinds. One is made in Upper Palaeolithic style, as at Cushendun and Rough Island in Ulster

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[1] Burchell, 1931, pp. 282–7.

[2] McCallien and Lacaille, 1941.

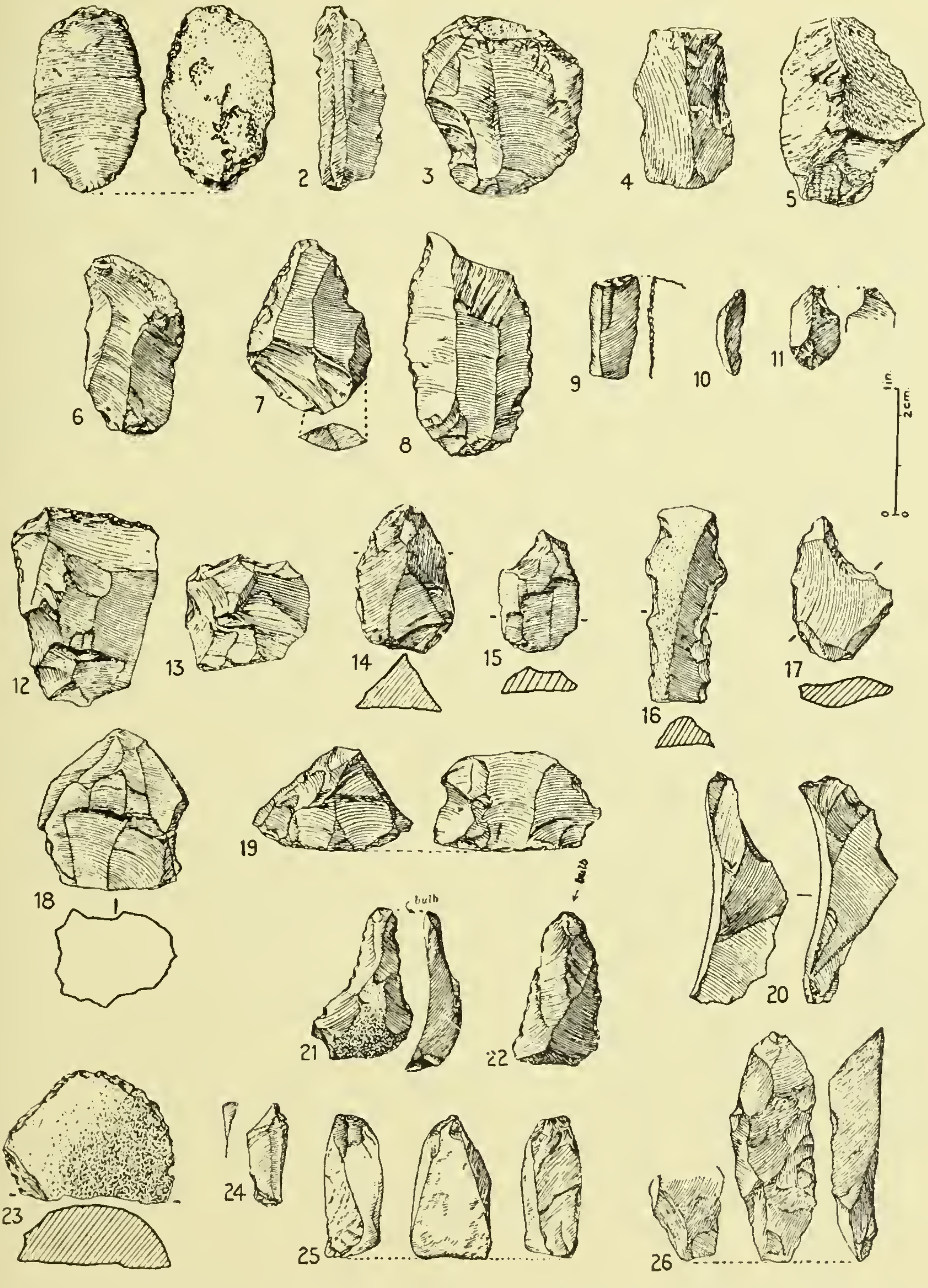

FIG. 54. Advanced Early Larnian implements from Albyn Distillery, Campbeltown. Nos. 1–3, 6–8, 10–24 in flint; no. 4 in schistose grit; nos. 5, 9, 25–26 in quartz. (After McCallien and Lacaille, 1941.)

and at Dalaruan and Millknowe in Kintyre. The other is manufactured by Tardenoisian micro-burin technique. No. 9, prepared in the lower part of a flake (quartz), is representative of the older tradition, and no. 10, fashioned in the upper part of a blade (flint), typifies the later. Complete proof that this second method, developed in Mesolithic industries, was practised at Albyn Distillery is provided by characteristic waste micro-burins (e.g. no. 11 in flint).

Flakes, as the basis of retouched edge-tools, appear in the following common forms: end-scrapers, no. 12; thumb-nail scrapers, no. 13 (flint); rare side-scrapers, as no. 14 (flint); hollow-scrapers, no. 15 (flint). A variant of the last, no. 16 (flint), compares more closely with the Aurignacian *lame-à-coche* than does any Irish example.

Plain perforators and variants occur in combination with the concave scraper. No. 17 (flint) is the exact counterpart of types recorded from the Early Post-Glacial littoral deposits of north-east Ireland.

As material suitable for implements was scarce in this part of Scotland, the prehistoric workman had to make the best of what was available. In order to extract the utmost he had, therefore, to strike the nodules and pebbles from different angles. Hence it is not surprising that core-forms in the Albyn Distillery assemblage are varied. Many show wear from use as choppers, and perhaps as hatchets or wedges. Still, the ordinary pyramidal shape is commonest, e.g. no. 18 (flint). It is frequently converted into a scraper by edge-retouch, as no. 19 (flint).

This industry yields many flakes detached from cores in the preparation of fresh striking-platforms. No. 20 (flint), an unusually large specimen, is a common form. A few such core-trimmings bear signs of wear, and even retouch, at the bulbar end. Ranking with the prototypes of the Larne picks of north-east Ireland, these are the first examples to be identified on the mainland of Britain. Exact counterparts of the classic Irish form in the Albyn Distillery collection are figured here, no. 21 (flint) with crust adhering to its wide recurved end, and no. 22 (flint) removed from the decorticated flank of a well-flaked lump.

Steep scrapers made in small, thick, and round pieces of flint and quartz pebbles are common, e.g. no. 23 (quartz).

Although artifacts made in bone have not been found at the Albyn Distillery site, yet bone-working is indicated by several stone tools. In addition to the cores probably used to split bone, flake-implements with wide bevelled chisel-like ends are present. True gravers, however, are more decisive, for instance no. 24 (flint) and no. 25 (quartz).

The most important single specimen in the Albyn Distillery series is a well-made quartz tool, no. 26. It is flaked bifacially in its lower part and on one face only in the upper. This treated end is intended to serve as a pick, but the lower and chisel-like working-edge is made in exactly the same way as a Maglemosean *tranchet*.

From the drawings it will be seen that the Albyn Distillery industry is definitely comparable with the Early Larnian facies of Ulster,[1] Dalaruan, and Millknowe. That it marks an advance on these normal Early Larnian groups is not indicated by stratigraphy but by typology. Though it includes none of the characteristic developed forms of the Late Larnian of Ulster, yet it is tinged with other cultural influences. These, unless the contrary is proved, could only have reached Scotland by Early Atlantic times, as has been pointed out in Chapter IV. Thus, the Albyn Distillery collection includes Tardenoisian forms, such as are met with in the upper levels at Mother Grundy's Parlour, Creswell Crags, and in the non-geometric microlithic industries from the country east of the Pennines and the Border region. Moreover, it contains objects made in the same Maglemosean (Baltic Forest Culture Period II) style as appears in a few tools from the Tweed valley and elsewhere in Scotland (pp. 165–7, 193–4).

(iii) Diggings connected with the Calton Housing Scheme and other public works behind the Albyn Distillery site have been watched. As a result, animal bones, including a tooth of a small breed of wild horse, a bone of *Bos* (? *primigenius*), and the mandible of a fox or large dog, all much decayed and friable, with some quartz and many patinated flint implements have been recovered from the deposits of the beach, which here rises to more than 40 feet above O.D.[2] The lot comprises the usual Early Larnian forms of the Albyn Distillery industry and several micro-burins. These by-products, together with those previously found and the steeply retouched tools made in material cut by the specialized micro-burin technique, testify to the strength of Tardenoisian traditions in the industries from deposits of Atlantic age in Kintyre. They afford further proof that Tardenoisian strains penetrated into Scotland earlier than was formerly believed.

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[1] Cushendun, Horizons 1 and 2; Island Magee, Horizon 1; Rough Island, Horizon 1; Movius, 1942, p. 148; above, p. 148, and Fig. 49.

[2] Webb, 1946.

(B) BALLANTRAE, CARRICK, AYRSHIRE

The existence of prolific flint industries at Ballantrae, in Carrick, Ayrshire, on the east side of the Firth of Clyde opposite Campbeltown, is shown by the large privately owned Edgar Collection.[1] This was gathered from the soil topping the Early Post-Glacial raised beach on the left or south bank of the Stinchar estuary (Pl. IV *b*). Here, below the drifts of the last glaciation, the conspicuous feature which records the marine invasion of Atlantic times lies between the 50- and 20-foot contours. Protected by hills on three sides, the locality provided an ideal environment for settlement, and reproduced that afforded by the small sheltered estuaries on the Irish side of the North Channel. In the lower Stinchar glen communities would find abundant supplies of food in the stream, on the estuarine grounds, along the sea-shore, and on the rocks.

Standards for Ballantrae are found at Rough Island, Strangford Lough, Co. Down. Here deposits containing Early Larnian industries (Horizon 1, Deposit B) are directly capped by humus rich in 'Early Neolithic' products (Horizon 2, Deposit A).[2] Here also agriculture has in places disturbed the underlying bed and mixed its archaeological contents with the characteristic artifacts of the overburden. Examination of sections in the Stinchar valley confirms the fact that the plough has brought about a similar state of affairs at Ballantrae. Overlying the beach formation of gravel and sand containing Mesolithic implements, the soil with flints and shells of *Littorina* species in its lower part consists of sandy material mixed with hillwash brought to fertility by long cultivation.

On the score of the manner of their occurrence, physical condition, typology, and workmanship, the components of the Ballantrae collection point to an Early Larnian settlement, followed long after by one coeval with the full English Neolithic, and later again by Bronze Age immigrations. One of the last is commemorated by the setting of megaliths, called the Standing Stones of Garleffin, at Greddock south of Ballantrae Bridge. It is between this and Downan Point that most relics of the earliest Post-Glacial colonization have been found.

The group which indicates an Early Mesolithic occupation at Ballantrae is particularly distinguished from the other series by the heavy chalky white patination of all its components. Many, besides, have dulled ridges and edges, or a rotted look due doubtless to the attacks of some corrosive property of the containing bed. The small suite figured here (Fig. 55) shows how closely its representative forms resemble those found stratified in the Early Post-Glacial littoral deposits of Ulster and Kintyre.

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[1] Lacaille, 1945.

[2] Movius, 1940(*b*), pp. 112–18.

Like their fellows on the Irish and Argyll sides of the North Channel, the settlers in the lower reaches of the Stinchar depended mainly on flakes and blades from 1·5 to 6 cm. long.

Good parallel-sided blades are far more frequent here than at the Campbeltown sites. These simple tools, worn from use as knives and scrapers, are the most numerous relics (e.g. nos. 1–4). The character of this basic material is not lost in simple edge-retouched implements (e.g. no. 5).

Though uncommon, small abruptly trimmed blades occur (e.g. no. 6). In these the retention of the bulb of percussion and the relatively thick back show the persistence of Upper Palaeolithic tradition.

Leaf-shaped forms with slight marginal trimming, suitable for arming a light shaft, are fairly represented. One (no. 7), however, seems to mark an advance on these, since it is rather thick and carefully retouched along one edge and round the tip. So far, without a Scottish counterpart, it is matched only in Irish Early Larnian industries, particularly at Rough Island.[1] It is noteworthy as belonging to a distinctive category of implements, which was probably devised in north-east Ireland and reached its full development there in Sub-Boreal times (below, p. 251).

Scrapers occur, most manufactured in portions of thick flakes, some crusted and others scarred from primary work on the nucleus. The so-called thumb-nail variety, of irregular outlines and crude dressing, predominates (e.g. nos. 8 and 9), but there also appear rounder and steeper tools (as no. 10). Finely executed end-scrapers on flakes and blades are rare, but a few (e.g. no. 11) stand out by reason of their unusually delicate treatment.

True side-scrapers are absent. Lateral convex working-edges, however, appear in conjunction with other dressed margins, both in thin material (as no. 12), and in thick (as no. 13).

Several concave scrapers (e.g. no. 14) carry down the tradition of the Aurignacian *lame-à-coche*. There occur also side hollow-scrapers with a projection for use as a perforator (e.g. no. 15). Most are the parallels of

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[1] Movius, 1940(*b*), p. 125.

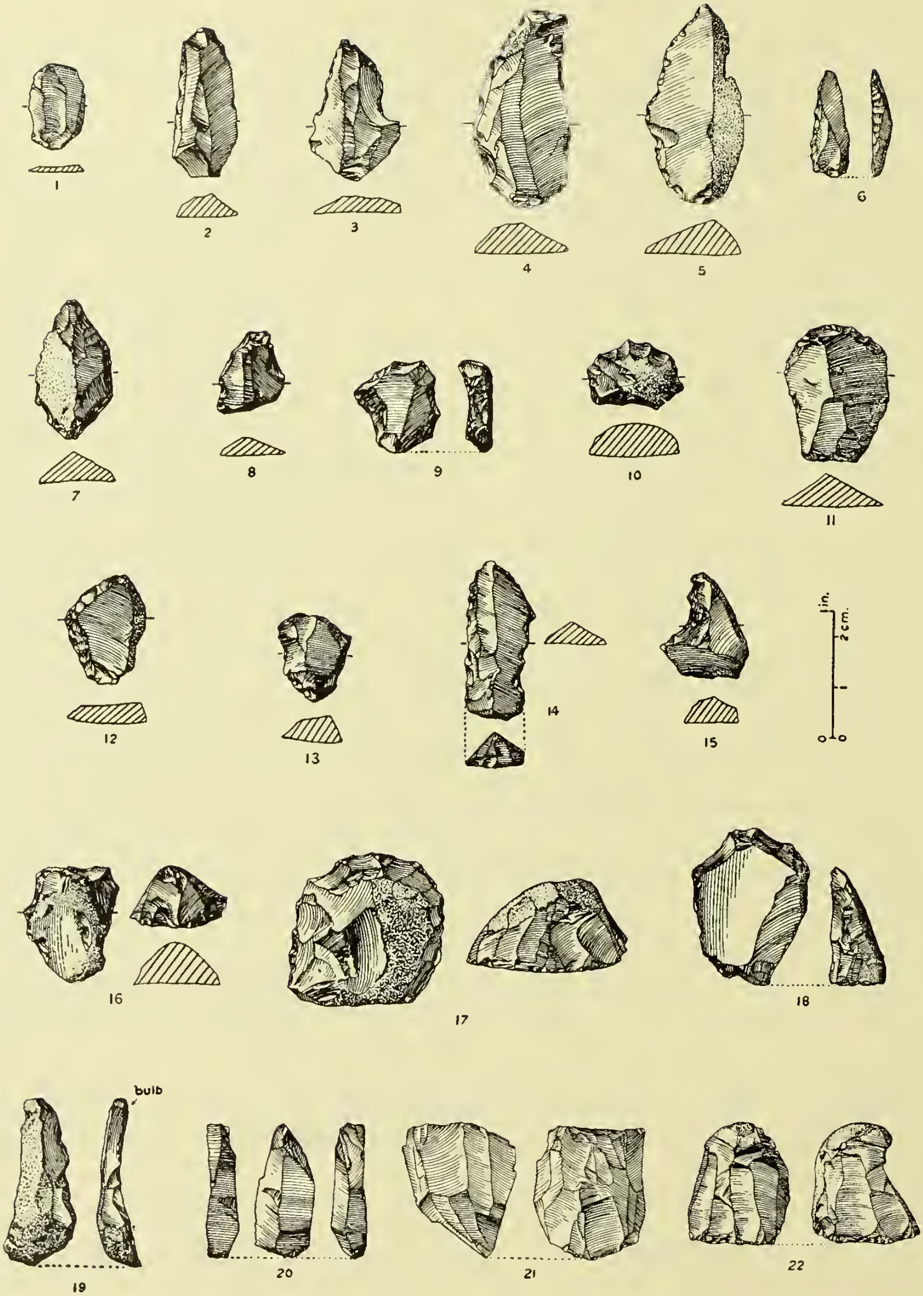

FIG. 55. Early Larnian flints from Ballantrae, Carrick, Ayrshire.

tools met with in the Early Mesolithic series of Ulster and the Kintyre littoral.

Steep scrapers made in thick flakes and cores are fairly represented. In some (e.g. no. 16) the face is vertical, in others inclined (as no. 17). A few (e.g. no. 18), fashioned in core-trimmings, show an elaboration of these simple forms.

Ties with the Mesolithic culture evolved in north-east Ireland are further indicated by prototypes of the Larne pick (e.g. no. 19), with characteristic elementary marginal dressing and wear at the narrow end, and crusted wide plunging area opposite.

Upper Palaeolithic traditions persist in a few plain gravers. This is clearly shown by a specimen (no. 20), made on a short thick flake, which exhibits two short facets on the left backed against a pair of similar scars on the right.

Cores specially adapted by trimming have a place in this Carrick group. Thus an example (no. 21), finely flaked to an inclined face, resembles the tools in the Dalaruan–Millknowe, Albyn Distillery, and some Irish collections thought to have served as wedges for splitting bone; and another (no. 22), with carefully retouched basal margin, is representative of a small lot of core-scrapers.

Despite the lack of accurate stratigraphy, it may be assumed that this set of artifacts belongs to the Early Larnian complex. It would be referable, therefore, to one of the first waves of colonists to reach this part of Scotland from the south in the Post-Glacial period, since the implements are strictly comparable with the products of the Early Larnian industries of Ulster, Dalaruan, and Millknowe. Like these, they are unaffected by the Tardenoisian and Baltic Forest culture influences which are apparent in the more advanced Early Larnian facies from the Albyn Distillery site.

(c) SPORADIC FINDS

(i) That Tardenoisian technical methods reached the south-western mainland country early in the Atlantic climatic phase, and about the time when they penetrated into Kintyre, is suggested by the micro-burins reported from the Early Post-Glacial beach at Stranraer (p. 144). Unfortunately the exact circumstances of their discovery are not known and the artifacts have not been traced. It cannot, therefore, be asserted that they antedate the Tardenoisian microlithic forms which are well represented in

Ayrshire industries later than those producing Early Larnian types, as at Ballantrae[1] and Shewalton.[2] The absence of details also precludes the grouping of these micro-burins with the various deeply patinated flint implements which have been recovered from the raised beach in the south-west.

(ii) Some stray finds of patinated flints from the raised beach on the west coast of Kintyre, in Tiree, Islay, and other islands, suggest that the Larnian culture had spread widely early in the Post-Glacial period. In this connexion an old report may be mentioned. It concerns a piece of cannel coal, described as a rude ornament, found resting upon the surface of the boulder clay, and covered with gravel containing marine shells, 50 feet above sea-level, on the Ayrshire coast at Dundonald.[3] But, since the object has not been traced, it is impossible to say if it was a true artifact. The notice is interesting, however, because it shows that as long as eighty years ago an enlightened geologist recognized the archaeological possibilities of raised beach deposits in south-west Scotland. Safer is the record of a hollow-scraper found 10 feet down in stratified sand at Bartonholm, Dundonald parish, Ayrshire, in conditions indicating a considerable rise of the land since the tool was lost.[4] It is, however, impossible to say if this single specimen is referable to an early or late industry.

There is less room for speculation in the representative series figured here (Fig. 56). This is composed of examples found by several searchers, as well as some preserved in the Kelvingrove Museum as remainders of groups displayed in 1911 at the Scottish Exhibition, Glasgow.[5] Its geographical range extends from Luce Bay on the Solway Firth to Shewalton, near Irvine on the Firth of Clyde, and includes localities on the west and north-west coasts of Arran. These artifacts are strikingly like the Late Larnian implements of north-east Ireland. From the rolled and injured condition of most it is evident that they were subjected to the same ill-treatment as the Irish relics. Verification of their mode of occurrence supports this. Examined also from typological and technological angles, the Scottish and Irish implements show a marked resemblance. Though it is smaller than a normal run of Late Larnian artifacts from north-east Ireland, yet this Scottish series indicates the connexion with the Mesolithic

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[1] Edgar, 1939.

[2] Lacaille, 1930.

[3] Lyell, 1873, p. 61.

[4] J. Smith, 1895, p. 123.

[5] Scottish Exhibition Catalogue, 1911, Case 2, nos. 1, 2, 4, and 5, pp. 811–12.

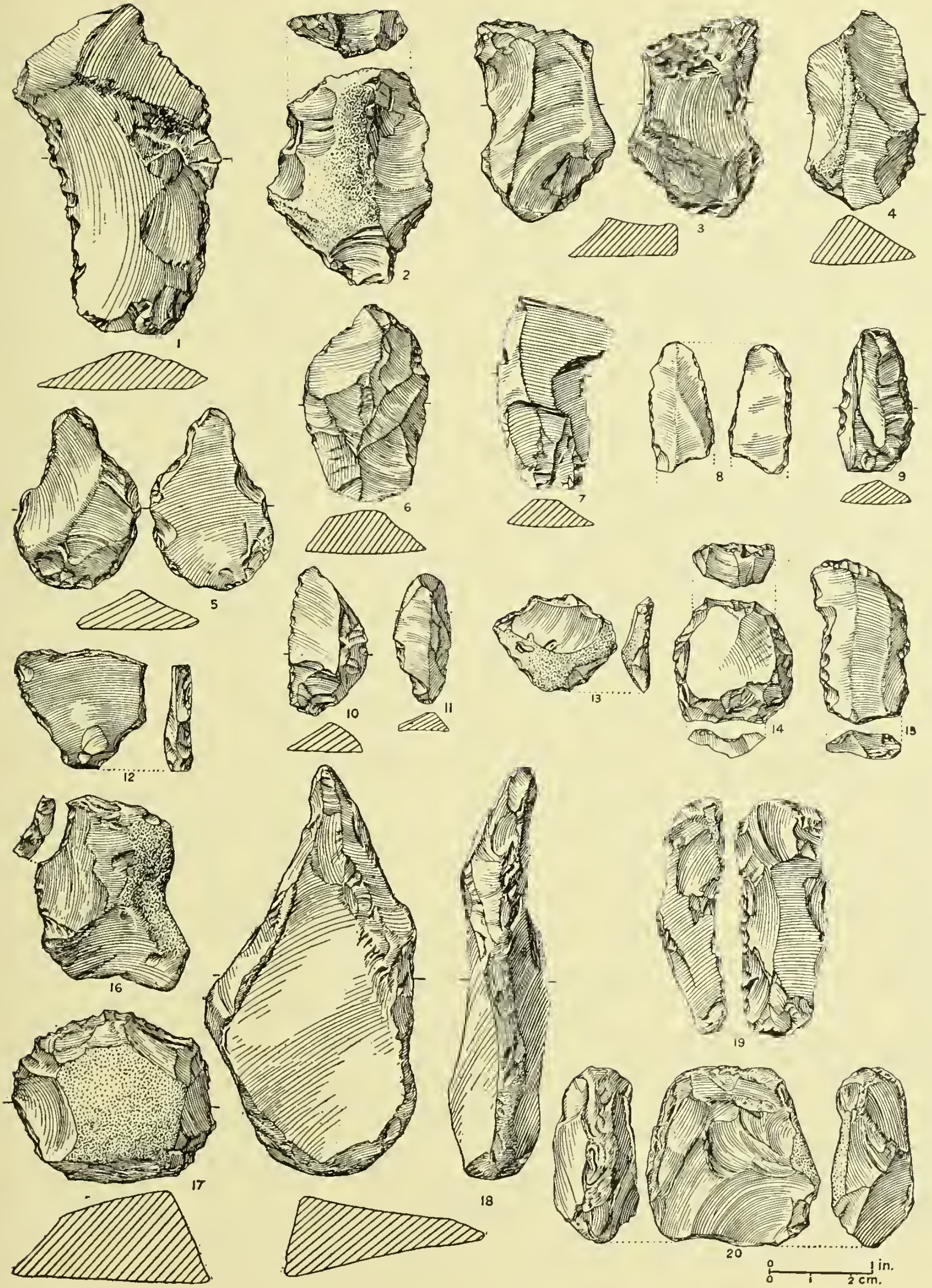

FIG. 56. Flints of Late Larnian type from sites on the shores of the Firths of Clyde and Solway. Nos. 1, 4, 6–7, West coast of Arran; nos. 2–3, 5, 17, Grennan, Drummore, Wigtownshire; no. 8, Ballantrae, Ayrshire; no. 9, North-west coast of Arran; nos. 10–11, North coast of Arran; nos. 12–13, 15, Shewalton, Ayrshire; no. 14, Stranraer, Wigtownshire; no. 16, Terally, Drummore, Wigtownshire; nos. 18–19, Drummore, Wigtownshire; no. 20, Luce Bay, Wigtownshire.

culture, which was cradled on the widened maritime tracts during the Boreal climatic phase and developed during and after the submergence of Atlantic times. In most of its constituents the group shows a decline from Early Larnian standards. It certainly preserves tinges of an Upper Palaeolithic ancestry, but the rather crude workmanship and the heaviness of many specimens seem to mark the departure from the ancient tradition. These implements, therefore, may be regarded (*a*) as later than those of the Albyn Distillery, (*b*) as belonging to the Larnian complex, and (*c*) as the equivalents of some Late Larnian products of north-east Ireland.

The illustration of characteristic forms found in the storm beach of the Early Post-Glacial sea (Fig. 56) shows: flakes and blades (nos. 1–11); scrapers (nos. 12–17); picks (nos. 18 and 19); and a core (no. 20).

(iii) Occupation in south-west Scotland by Mesolithic longshore squatters may also be denoted by accumulations of shells and bones associated with the Early Post-Glacial raised beach. That such remains occur is suggested by the disclosure of a Late Larnian midden deposit in stratified conditions at Rough Island, Co. Down, the Irish site which provides so many parallels to Ballantrae.[1] Other possibilities of establishing links in the culture sequence are indicated by the knowledge that a considerable shell-mound formerly stood on the beach at the mouth of the Stinchar River.[2] In age this group may correspond to the archaeologically rich refuse of occupation farther north, which has been mentioned (p. 144), and which is considered in detail later (Chapter VII).

(iv) The Larnian assemblages from south-west Scotland, in common with those from north-east Ireland, do not include any bone-work. Yet, when we consider the ancestry and economy of the Larnian culture, it is difficult to believe that bone-work did not exist, particularly since gravers have been found at Campbeltown and Ballantrae. Of course, stone flakes and blades would be used by the coastal squatters to arm shafts, just as many microlithic forms served to barb the hunting- and fishing-gear of their manufacturers. We must, therefore, speculate on the age of the large, bilaterally barbed point made in red deer antler, which was retrieved from the bed of the River Dee at Cumstoun, near Kirkcudbright,[3] and which has been so often quoted. It has been suggested that this remarkable specimen (Fig. 57) indicates influences of the later Obanian culture in southern Scotland.[1] Recent researches, however, show that Obanian traditions were borne northward from their centre in Argyll.[2] Moreover, by the time this late Mesolithic culture was developing in the west, powerful influences were probably entering the Solway region from the south. The object, which was evidently lost by a fisher, may not indeed go back so far as the period of the emergence of the Boreal climatic phase, when cultural strains would be carried from north-west England over the territory reclaimed from the Irish Sea (pp. 96–99). But it may well be contemporary with a stage of Larnian development during the subsequent Atlantic climatic phase. This view is supported by its deep blackish-brown colour, indicating a long sojourn in peat, and by its completely mineralized condition and smoothness which give it the appearance and feel of great antiquity. This is supported by comparison with antler and bone examples from such sites as Oban, Oronsay, and Shewalton to be mentioned later (pp. 204–8, 213–14, 287–8).

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[1] Movius, 1940(*b*), pp. 121 ff.

[2] J. Smith, 1895, pp. 227–8; Lacaille, 1945, pp. 87 ff.

[3] Munro, 1898, pp. 231–2. This relic is preserved in the Stewartry Museum, Kirkcudbright.

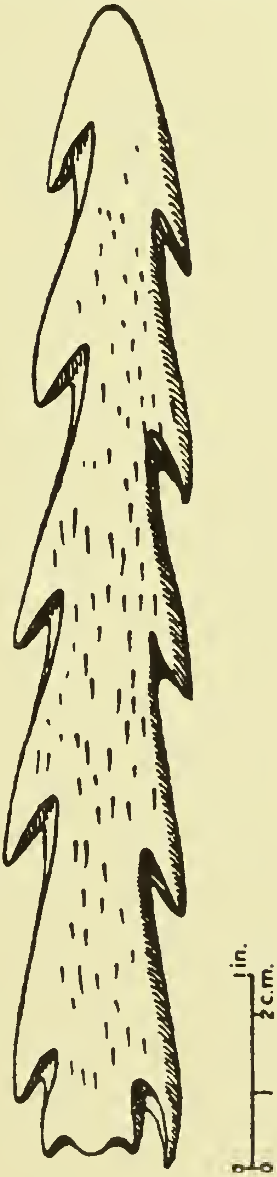

Fig. 57. Barbed point of red deer antler from the bed of the River Dee at Cumstoun, near Kirkcudbright. (After Munro, 1898.)

(D) IMPOSITIONS ON THE LARNIAN

(i) An obvious inference can be drawn from the suggestion advanced that probably quite early in the Atlantic climatic phase contacts took place in the lower Tweed basin between migrants from the east and south (above, p. 119). This inference is that the Tardenoisian and Baltic Forest culture elements, which intruded upon the Larnian industries, were borne from south-east Scotland.

The Lothians, Forth basin, and Central Plain suggest a passage for these strains from the North

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[1] Movius, 1942, p. 188.

[2] Lacaille, 1951; also Chapter VII.

Sea area to the south-west. A more direct track, however, is indicated. Support for it lies first in collections gathered over a considerable length up the valley of Tweed.[1] Here Tardenoisian forms and flaked stone tools of Maglemosean aspect and technique have been found.[2] Other significant indicators are provided by recent discoveries of stone implements at several places in the Upper Ward of Lanarkshire, within a few miles of the upper reaches of Tweed, and a series from Woodend Loch, near Coatbridge, which is comparable with Tweedside groups.[3] All these point to the Biggar Gap, that col between the great bends of Tweed and Clyde through which great glaciers discharged their melt-waters towards the end of the retreat of the New Drift ice, as the route whereby these cultural strains passed from the east into Clydesdale and beyond (below, pp. 185–93).

Though the Tyne Gap cannot be excluded as a possible route from the region of the east Pennines and the maritime lowlands of the North Sea basin,[4] yet it can in the meantime be dismissed. For, apart from the unconfirmable report of flaked stone tools from the Cumberland coast,[5] there is no hint of the use of this gap in the Early Post-Glacial period (p. 121). North of the Carlisle Plain only the lower reaches of the rivers flowing south-west and south into the Solway Firth would offer any inducement to settlement. As routes, their inhospitable upper reaches in the Southern Uplands would be as unattractive to migrating peoples as the difficult west Pennines.

(ii) As stated in Section 3 (pp. 134–5), it is mainly owing to the absence of primary stratigraphy that Late Larnian developments in Ireland are as yet imperfectly known. The same statement applies to the Mesolithic succession associated with the Early Post-Glacial littoral deposits in south-western Scotland. Only systematic excavations and observations of sections along the coasts of the North Channel will lead to the establishment of Mesolithic subdivisions. Meantime, from this review it can be concluded that the Mesolithic industries of the Early Post-Glacial coastal formations diverged somewhat in different regions after the beginning of the Atlantic climatic phase. On the Scottish side this is first shown by the Albyn Distillery industry, which represents a development of the true Early Larnian. Found in secondary position in deposits of Atlantic age, but probably assignable to the time when the sea had already encroached considerably upon the land, it is a contemporary equivalent of a phase of the Late Larnian of north-east Ireland.

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[1] Lacaille, 1937.

[2] Idem, 1940, pp. 6–9.

[3] Davidson, Phemister, and Lacaille, 1949.

[4] G. Macdonald, 1921, p. 11.

[5] Dixon, Madden, Trotter, Hollingworth, and Tonks, 1926, p. 79.

Whereas Tardenoisian and Baltic Forest culture influences appear in the advanced Early Larnian industry of the Albyn Distillery, of the two, only Baltic Forest culture strains affected the Late Larnian of Ulster. This points to intercourse between Scotland and Ireland despite the expansion of the Early Post-Glacial sea. This phenomenon, however, did not prevent migrants from carrying these cultural strains, presumably from the Scottish mainland, across the Firth of Clyde into Kintyre. It implies navigation in the region during the Atlantic phase. Yet even before this, some forms of craft must have been used by the descendants of the Creswellian hunters, just as they were by the Maglemoseans in the North Sea basin. For, as is shown in Chapter II, the emergence of Boreal times, although a prime factor in migrations, could never have provided complete land-connexions between Britain and Ireland. We must meantime leave open the possibility of early navigation round the North Channel while man was developing his Mesolithic industries. The problem can hardly involve the canoes recovered from the estuarine deposits of the Clyde, Forth, and Tay (pp. 56 and 66). Heavy as is some of the Late Larnian equipment devised during the Atlantic climatic phase in north-east Ireland in response to the development of woodlands, none of it seems at all suitable for felling and shaping large timber for the construction of boats.

6. DISTRIBUTION OF THE LARNIAN CULTURE

Compared with the records from the littoral deposits of north-east Ireland, the discoveries associated with the Early Post-Glacial raised beach in south-west Scotland make a meagre display. Nevertheless, it is sufficient to demonstrate local differences, such as might naturally be expected over an extensive area and period. In these Mesolithic growths there continued many of the traditions fostered or initiated in a common centre of what may be regarded as a single province isolated in the west from the eastern Lowlands. This region, therefore, from the time of man's first-known settlement was a cultural pool on the very periphery of north-western Europe.[1] So far as the true Mesolithic industries are concerned, the artifacts and allied evidence indicate that this province comprises all the shores of the North Channel, including the Firths of Clyde and Solway (map, Fig. 58). Future researches should show the greater range and influence of the Larnian culture, whose developments between the seventh and third millennia before our era belong to the first pages of the human history linking Ireland and Scotland.

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[1] Fox, 1938, p. 41.

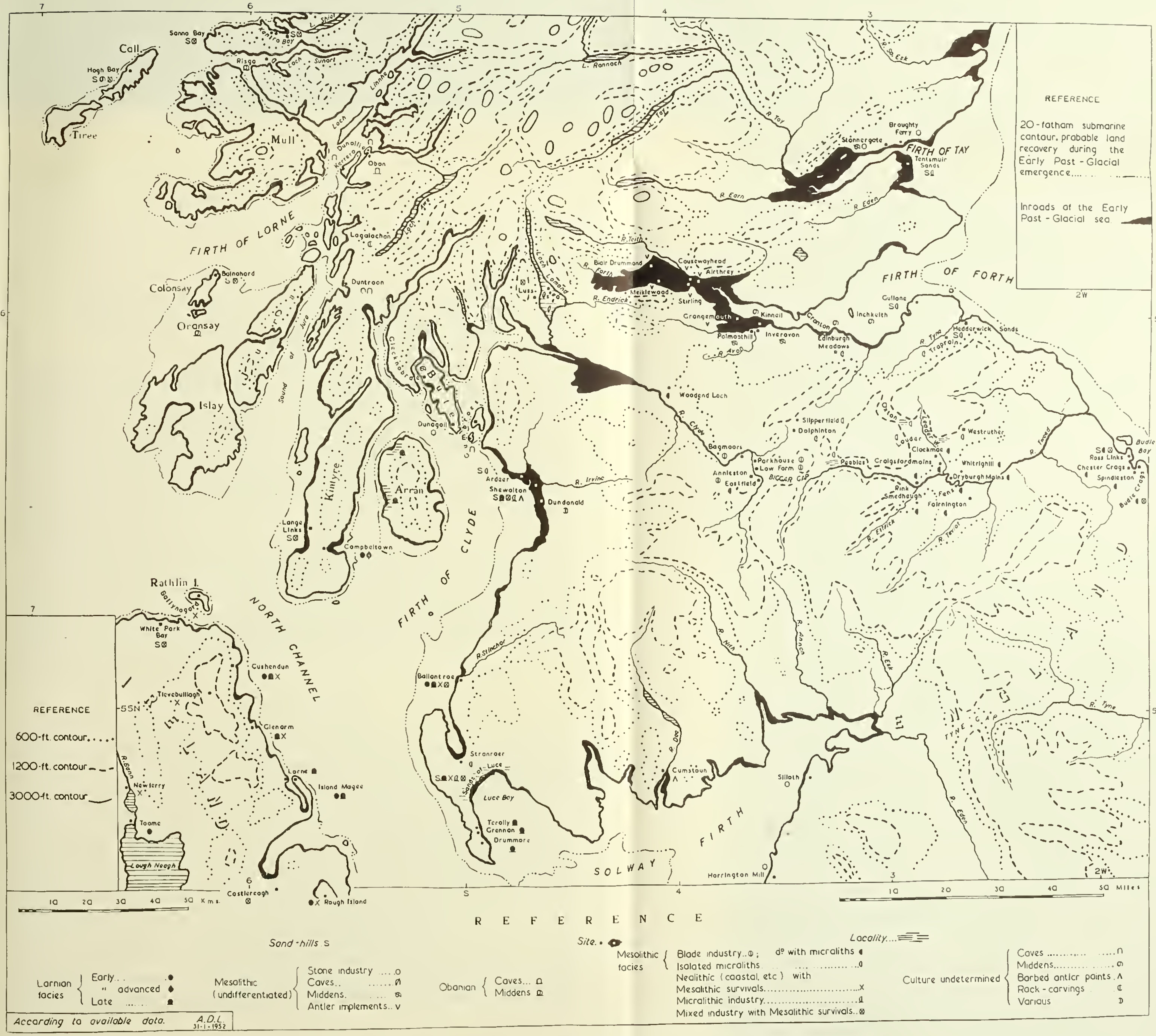

FIG. 58. Map of the southern half of Scotland, showing Stone Age sites and their associations.

VI

MESOLITHIC SETTLEMENTS IN THE NORTH SEA BASIN OF SCOTLAND

1. INTRODUCTION

THE Mesolithic cultural strains, glimpsed in the two preceding chapters (pp. 109, 119, and 157–8) as having reached and spread from south-east Scotland early in the Atlantic climatic phase, eventually became widely distributed. With certain notable exceptions their diffusion is known only from surface-finds. The locality richest in these is the Tweed valley, which since Late-Glacial times had not been affected by any great changes. Its stone industries provide many standards for comparisons in Scotland and outside.

Though scanty in numbers, the antler implements cited as having been found in the estuarine clays of the Forth are yet extremely important. Being positively assignable to the Atlantic climatic phase, they not only indicate the infiltration of elements derived ultimately from the Baltic region, but they are also the forerunners of types whose space and time range in Scotland was extensive.

2. TWEEDSIDE

(A) DISTRIBUTION OF STONE INDUSTRIES

The strong microlithic element in certain stone industries of the Tweed basin has long been recognized as linking the Scottish series with many series from the English north country. These industries are represented over a stretch of more than thirty miles, from Kelso in the east to Peebles in the west. Had searchers been more numerous, we should doubtless find that they extended farther west in the valley. Yet this extension is already suggested by the finds mentioned from south-west Scotland and from intermediate localities in Clydesdale which have still to be discussed. These discoveries indicate further that some Mesolithic cultural elements were carried from the Tweed valley through the Biggar Gap.

The Tweed valley, which had been deglaciated relatively early, would offer great attractions to food-collectors. From the mouth of the river and the eastern end of the Cheviot Hills to a point north of Drummelzier, where the Tweed is joined by the Biggar Water and assumes an easterly course, migrant bands would find a sheltered and not too densely wooded region which comprised alluvial plains and marshes. Land animals and wildfowl were plentiful in this area, and fish abounded in the main and tributary waters.

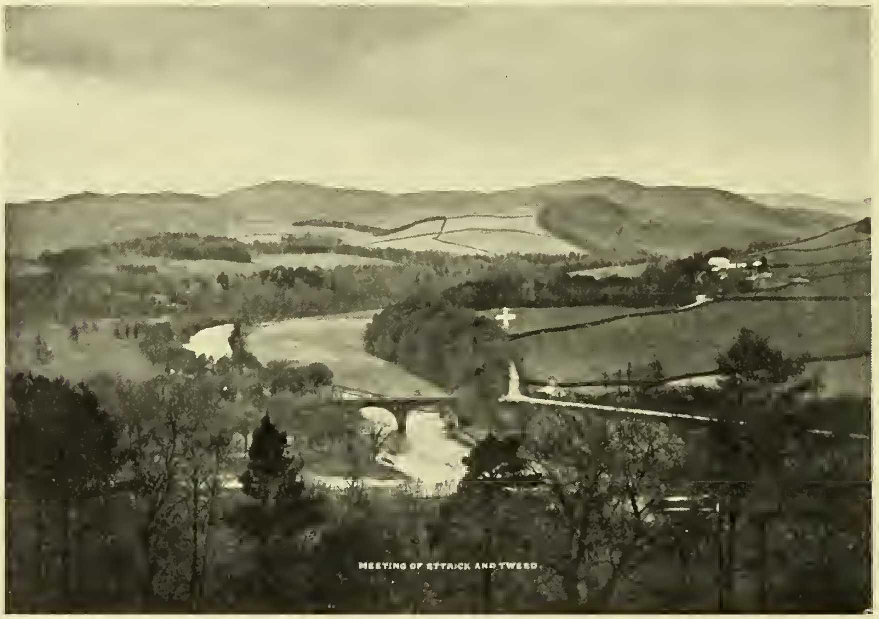

FIG. 59. View of the Rink Farm site at the confluence of Ettrick and Tweed. (After Mason, 1931.)

The principal assemblages of relics of the Early Post-Glacial colonization of the Tweed valley come from the farm Dryburgh Mains, Mertoun parish, Roxburghshire. They are composed chiefly of artifacts turned up by the plough in 12 inches of sandy clay resting upon gravel on the fertile haughlands, about 20 feet above the river and barely 300 feet above sea-level. Among other localities in the Tweed basin from which implements of Mesolithic facies have been reported between the two extremes given above, may be mentioned: Fairnington, near Roxburgh, the Fens in St. Boswells parish, and Clackmae in Melrose parish, all in Roxburghshire; Smedheugh, Lindean, and other places near Selkirk; Westruther, Craigsfordmains in Earlston parish, Oxton, and Lauder parish, all three in Berwickshire. As a rule, the relics have been found on the low ground near the rivers, but an important series is recorded from a knoll 80 feet above river-level at the Rink Farm (Fig. 59) close to the confluence of Ettrick and Tweed near Selkirk.[1] The distribution is shown on the map (Fig. 58).

At Rink Farm and around Dryburgh Mains working-sites are indicated by concentrations of cores, quantities of waste, and well-defined forms. Among thousands of relics from such areas the only post-Mesolithic forms are a few barbed-and-tanged arrow-heads and ground stone axe-heads. It is a question whether these are strays, or whether the Mesolithic types, by which they are so overwhelmingly outnumbered, point to the long persistence of ancient traditions in this as in other regions.

(B) FACIES

(i) All the recorders of these finds have stressed the microlithic character of the artifacts. These have often been misleadingly called pygmy flints. One writer has described as Tardenoisian a collection from Dryburgh Mains acquired in 1926 by the National Museum of Antiquities, Edinburgh.[2] This term is now seen to be too restrictive. To continue its use is to ignore other aspects in large privately owned assemblages from Dryburgh Mains and elsewhere. For, in the stone industries of the Tweed valley which comprise microliths, there occur Upper Palaeolithic types and Mesolithic elements besides Tardenoisian (Fig. 60).

(ii) The Upper Palaeolithic features of these industries would certainly be emphasized if larger basic flakes and blades could have been extracted from the raw material available on Tweedside. Here the settlers used a great variety of stones of many colours. On this account alone the appearance of their relics is striking. River and drift pebbles were employed, most of them green and brown chert derived from the lenticular bands which occur in the Ordovician formation from East Lothian and Berwickshire to Irvine and Ballantrae in Ayrshire. Chalcedony, plain, spotted and banded jasper, jaspilite, quartz, and even baked claystone served also in any form, and flint when it could be got. In short, any local material was used that lent itself to splitting and flaking.[3]

Upper Palaeolithic tradition appears in utilized flakes and blades (as Fig. 60, nos. 1 and 2); simple end-scrapers on flakes (nos. 3 and 4) and

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[1] Mason, 1931, pp. 414–17.

[2] Callander, 1927.

[3] Ibid., p. 326.

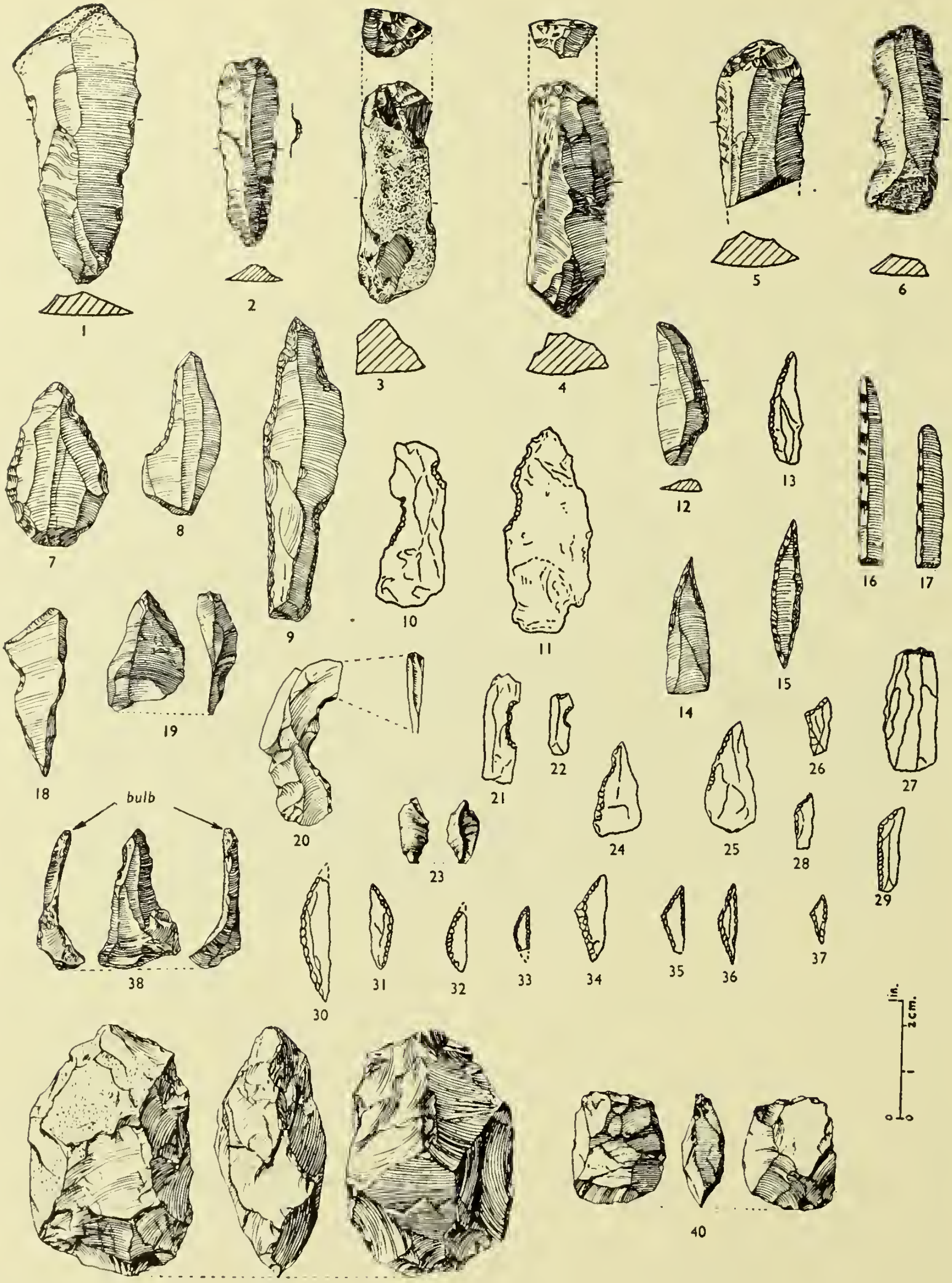

FIG. 60. Implements of chert, flint, and other stones from Tweedside. No. 1, Fairnington, near Roxburgh, Roxburghshire; nos. 2, 5–6, Craigsfordmains, near Earlston, Berwickshire; nos. 3–4, 20, 23, and 38, Dryburgh Mains, Mertoun, Berwickshire; nos. 7–9, 12, 14–18, Dryburgh Mains (redrawn from Stirling); nos. 10–11, 13, 21–22, 24–37, Dryburgh Mains (after Callander, 1922); nos. 19 and 39, Clackmae, Melrose, Roxburghshire; no. 40, Dryburgh Mains.

on blades (as nos. 5 and 6); in trimmed parallel-sided blades (nos. 7 and 8); retouched and hollowed blades (e.g. nos. 9–11), some being like Aurignacian *lames-à-coche*; in fairly good gravers (as nos. 18–20); and in well-retouched core-scrapers. Some steeply dressed, relatively thick blades and rods, retaining the bulb of percussion, recall the Châtelperron and La Gravette forms (e.g. nos. 12–17), which appear in the late Upper Palaeolithic (Creswellian) of England. The blades with edge-dressed lateral hollows (e.g. no. 10), and the short knife-like implements (as nos. 12 and 13), have to be distinguished from those made by Tardenoisian micro-burin technique. Thus the first, which are invariably broader, have to be separated from the usually narrow flakes and blades notched for division (e.g. nos. 21–22 and the micro-burin no. 23), and the second from the delicate, abruptly edge-blunted microlithic forms, non-geometric (e.g. nos. 24–29) and geometric (nos. 30–37), fashioned in portions of flakes and blades cut by the specialized method.[1] Fig. 60 includes specimens illustrated in 1927[2] and other artifacts believed to demonstrate the survival of Upper Palaeolithic traditions.

Particular interest is attached to the hinged flakes with retouched and/or worn, narrow bulbar ends (e.g. no. 38), which were evidently used in the Tweed valley in the same way as the Larne picks of the coastal stations in Ulster, Kintyre, and Carrick (pp. 132, 148, 153).

(iii) True, the abundance of Tardenoisian forms imparts a distinctive character to the Tweedside collections. This aspect, however, is not uniform. A few lots include non-geometric shapes only, others geometric and non-geometric. Some groups may therefore represent short sojourns, others long occupation at favoured sites. In this respect the collections from Dryburgh Mains are richer than any in Scotland in types derived ultimately from the Early and Middle Tardenoisian of the Continent, through the microlithic industries of the Mesolithic culture developed in the north of England (pp. 103–7). Although not found stratified, yet as a whole they would record successive immigrant waves from early in the Atlantic climatic phase onward.

(iv) Besides affording so much knowledge of the penetration of Tardenoisian elements into south-east Scotland, Tweedside furnishes evidence of the access inland of strains of Baltic Forest culture. These appear in the shape of picks and cutting-tools made in nuclei. Several bear the typical

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[1] Lacaille, 1942, pp. 105–13.

[2] Callander, 1927.

tranchet scar.[1] The series figured here shows how some components from Dryburgh Mains and Clackmae near Melrose are flaked and sharpened in Maglemosean style (Fig. 60, nos. 39 and 40). These tools were no doubt manufactured for cutting wood.

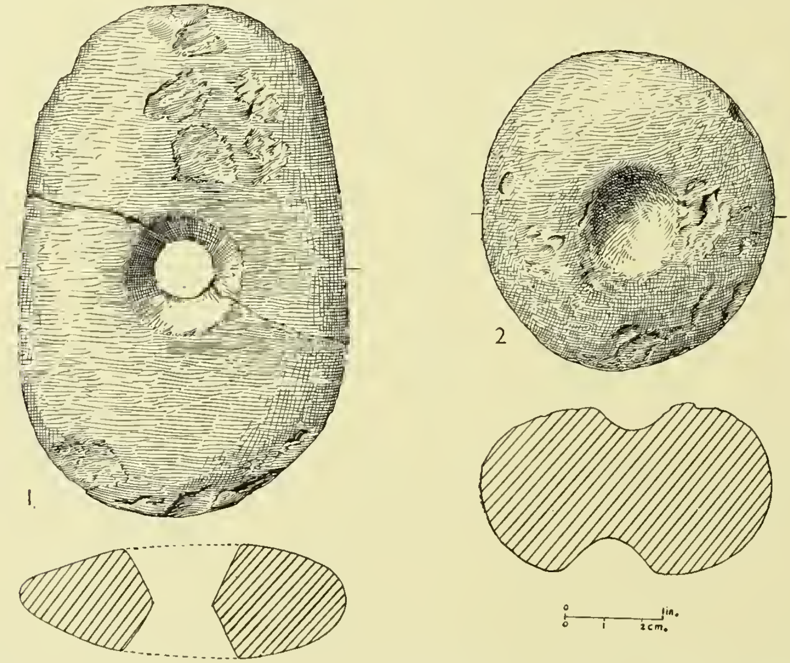
1
2
0 1in.
0 1 2cm.

FIG. 61. Pebble implements from Tweedside. No. 1, with hour-glass perforation; no. 2, with countersunk hollows.

(v) In addition to anvil-stones and hammer-stones used in the flaking and retouching industries, there occur stones chipped wholly or partly round the edges of one face. Waisted specimens, varying in size and weight, from under an inch in length and width to 9 by 4 inches, and from less than a quarter of an ounce to over 2 pounds, are generally supposed to have served as net- or line-sinkers.[2] This opinion is upheld by the fact that they usually occur near water. Unfortunately these objects cannot be dated. Still, despite the pitfalls of typology, it is tempting in some cases to see a remote connexion with Baltic Forest culture, which is already indicated in the Tweed valley by flaked stone implements. Such are pebbles with an hour-glass perforation, some being flat-faced, oval in section, and similarly holed, with a cutting-edge produced by pecking and rubbing on either face (Fig. 61, no. 1). Small hammers consisting of pebbles with abraded sides and pecked countersunk hollows for the user's thumb and forefinger may also be mentioned (no. 2).

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[1] Lacaille, 1940, pp. 6–13.

[2] Corrie, 1916, p. 312.

(vi) These comments and the illustrations show that these hybrid industries belonged to a culture of inland hunters whose mode of life and equipment were in the main like those of their Upper Palaeolithic ancestors. Hence these industries from Tweedside would represent an extension of the culture evolved from the decayed Creswellian, which was reinforced by several foreign elements in the north of England. In the Tweed valley some heavy types of alien origin were later added to this facies. The culture exemplified by these comprehensive industries of the Tweed basin, heralded, amplified, and developed during the Atlantic climatic phase—which it outlasted—must be regarded as the equivalent of the Larnian evolved by strand-loopers on the Irish and Scottish shores of the North Channel.

3. THE FORTH ESTUARY

(A) KITCHEN-MIDDENS

To the stone implements from Tweedside can be added evidence to show that Mesolithic strains spread farther and reached the Forth valley. In this connexion one thinks first of shell-heaps along the ancient high-water mark on the south shores of the Forth estuary close to the River Avon. The largest was noted on the right bank of this tributary, about 20 feet above O.D. and three-quarters of a mile inland, at Inveravon in West Lothian, between Bo'ness and Grangemouth.[1] Remains of hearths were plentiful among the shells, but no artifacts were recovered. The position of this refuse above the high-water mark of the estuary, distended by the Early Post-Glacial marine invasion, points to a sojourn of strand-loopers during the Atlantic climatic phase. Another,[2] broached in 1940 by a mechanical excavator on the left bank of the Avon at Polmonthill, Falkirk, Stirlingshire (Fig. 62), was ascertained before its entire removal to have been at least 170 yards long, 25 wide, and 3 to 4 feet thick. The bottom of the heap lay on an inclined base rising from 32 to 47 feet O.D. (Fig. 63). Its situation, the overlying and underlying deposits, its included content of oak charcoal, are all in keeping with a dating just subsequent to the period of maximum submergence. A further indication that this and neighbouring refuse of occupation are assignable to the warmer conditions of the Atlantic climatic phase, and therefore equatable with a late stage of the Larnian culture in the south-west, is the large size of the shells, mainly of oyster (estimated at six or seven million valves) with occasional mussel, cockle, periwinkle, and whelk.

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[1] B. N. Peach, 1879, p. 54.

[2] Stevenson, 1946, pp. 135–9.

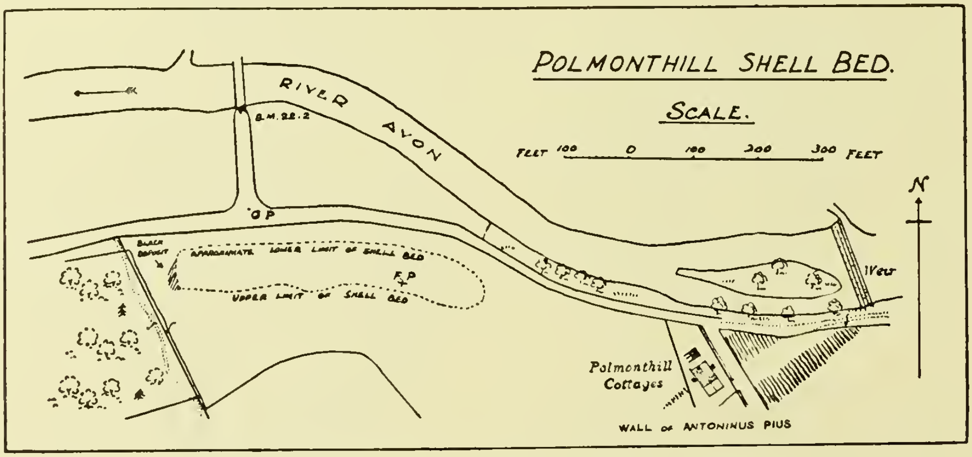

FIG. 62. Plan of Polmonthill, near Falkirk, showing the position of shell-heap. (After Stevenson, 1946.)

These sites would therefore suggest that, as the sea expanded and drowned the land reclaimed during the preceding climatic phase, migrants passed beyond the north of England and the Tweed along the North Sea coastal grounds and fens. They would, therefore, be far earlier than the remnants of a kitchen-midden exposed at low tide where the River Avon enters the Forth at Kinneil Kerse, three-quarters of a mile north by east of Inveravon and two miles west-south-west of Bo'ness.[1] These vestiges, including an abundance of molluscan shells, yielded no typical artifacts but only pieces of red deer antler, apparently cut by a metal tool. This midden is very interesting, because its situation within the rise and fall of the tide shows that the land has sunk since the accumulation was laid down.

This is a suitable place to mention the kitchen-midden which was exposed about eighty years ago at 8 to 10 feet above present high-water mark on Inchkeith opposite Leith.[2] This midden, frequently referred to in the literature, has often been thought to denote an Azilian site. It has more recently been regarded as possibly equatable with the late Mesolithic refuse of the Argyll caves and islands,[1] which is considered fully in the next chapter. This opinion is evidently based on the occurrence on Inchkeith of edge-worn flat pebbles and bone slivers, such as appear in the west with similar shells and animal remains.[2] However, save for the grey seal, now extinct in the Forth, only domestic forms are definitely represented among recorded bones. This fact and the situation of the deposit would point to a dating later than Mesolithic for the Inchkeith midden, which may therefore be coeval with the refuse exposed at low tide at Bo'ness. Rabbit bones found in the Inchkeith deposit are probably intrusive, and probably indicate interference in historic times rather than a very late but primitive settlement. Still, since none of the animal or archaeological remains has been traced for examination, the site must meantime be discounted as a link in a Mesolithic chain.

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[1] Callander, 1929.

[2] D. Grieve, 1872.

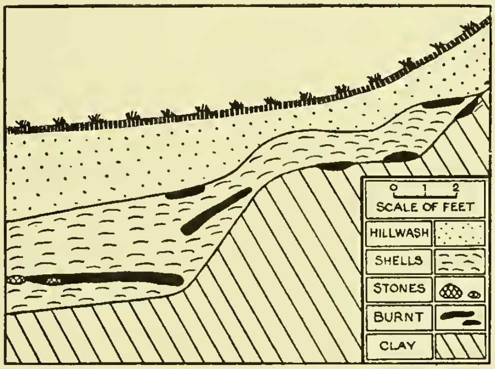

FIG. 63. Composite section through back of Polmonthill shell-heap. (After Stevenson, 1946.)

(B) ANTLER IMPLEMENTS FROM CARSE-CLAYS AROUND STIRLING

Implements of red deer antler recovered from the carse-clays around Stirling leave no room for doubt that Baltic strains penetrated into the Forth estuary. The objects, to which passing reference has been made (Chapter III, p. 73), owe their discovery to chance, chiefly during the reclaiming of peat-mosses and in engineering operations. Such works have, as already mentioned, revealed the remains of whales. Sixteen authenticated instances,

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[1] Movius, 1942, pp. 188 and 197.

[2] Anderson, 1898, p. 304.

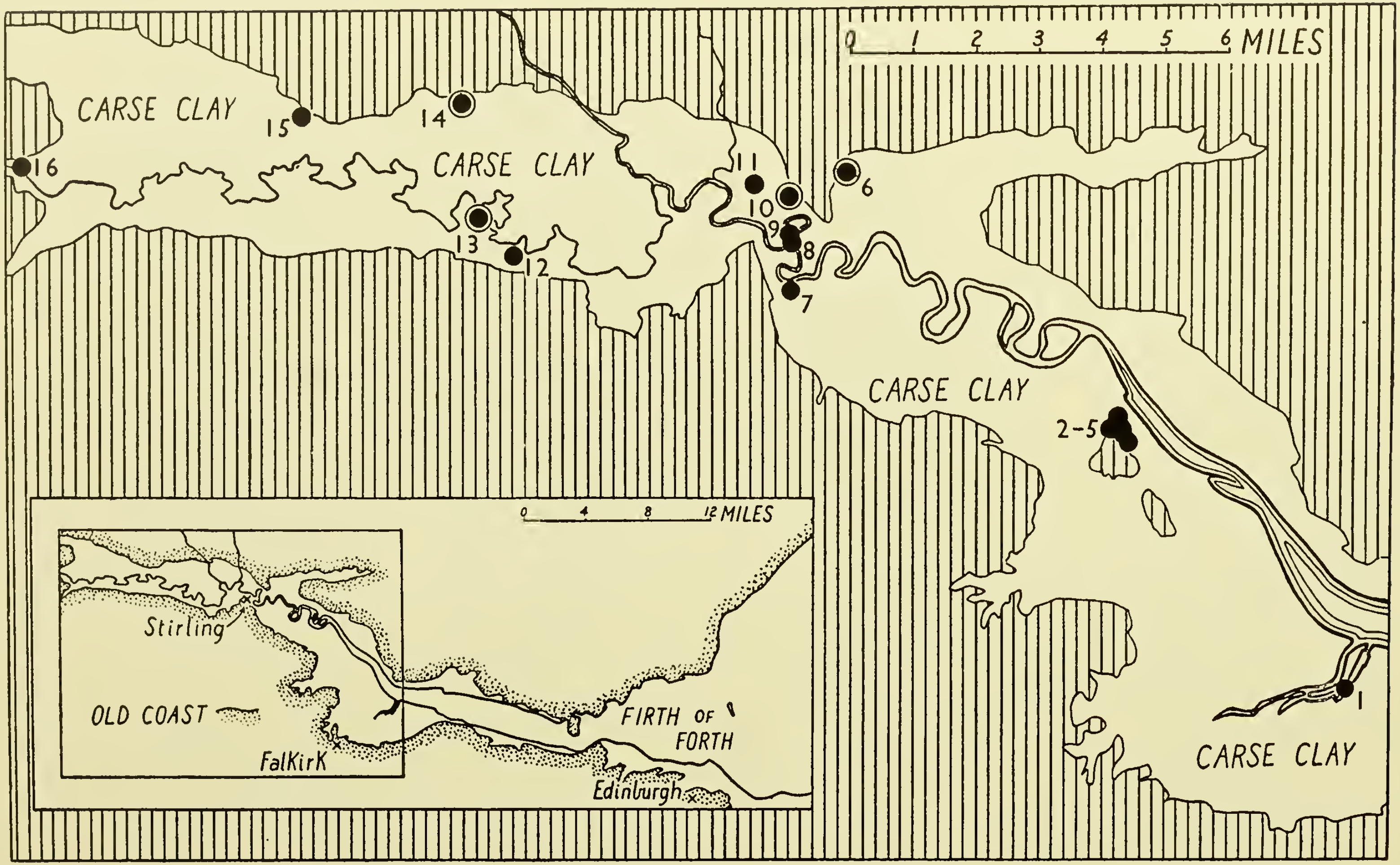

FIG. 64. Map showing the distribution of whale remains and red deer antler implements in the Forth estuary. No. 1, Grangemouth; nos. 2–5, Dunmore; no. 6, Airthrey; no. 7, Forthbank; nos. 8–9, Cow Park, Stirling; no. 10, Causewayhead; no. 11, Cornton; no. 12, West Carse; no. 13, Meiklewood; no. 14, Blair Drummond; no. 15, Ballinton; no. 16, Cardross. Nos. 6, 10, 13, and 14 were accompanied by implements of deer antler. (After Clark, 1947; based on Turner, 1889, Munro, 1899, and Morris, 1898, 1925.)

and a possible seventeenth, have been recorded, from Cambus, in Clackmannanshire, on the left bank of the Forth, to Cardross in Menteith, Perthshire. These are in addition to three from the same deposits downstream, at Falkirk and Grangemouth on the right bank, in Stirlingshire, and Broomhall near Limekilns, south of Dunfermline in Fife. The principal sites are shown on the map (Fig. 64).

All but one of the antler implements reported from the carse-clays were found associated with the bones of whale. Two, one perforated, lay 4½ feet below the surface on Airthrey Castle estate, on the left bank of the Forth in Logie parish, Stirlingshire. A holed fragment was taken from a depth of 4 feet in Blair Drummond Moss, on the left bank, in the barony of Burnbank, three-quarters of a mile west of Kincardine parish kirk in Menteith, Perthshire. Another, when unearthed at Woodyett on Meiklewood estate, on the right bank in Gargunnock parish, Stirlingshire, still retained in the hole a portion of a wooden handle. An improvised tool was recovered between 5 and 10 feet down at Causewayhead, about two miles north of Stirling, on the left bank. Only two of these relics have been traced, namely the holed specimen from Meiklewood, now in the University Museum at Edinburgh, and the simple tool from Causewayhead preserved in the Smith Institute, Stirling. The first (Fig. 65, no. 1) is made in the beam of an antler, one end sawn across, the other cut obliquely and rubbed down to an adze-like, but blunt, cutting-edge, and perforated in the bend. The second is a borer (no. 2); a short portion of the bend forms the grip, and the point consists of a curved brow tine artificially smoothed down. Two right horn cores of *Bos longifrons* Owen were also found with this object.

Another implement of red deer antler, found at Causewayhead, was unfortunately buried again before it could be examined.[1] A portion of whale rib, from the same deposit, is said to have shown signs of artificial smoothing. There is also the report that remains of a stick, resembling a handle, were discovered near the bones of a whale at a depth of 6 feet at Cornton brickworks on the left bank of the river, less than a mile from Stirling Bridge.

To the list of man's relics associated with the bones of whales in the carse-clay can be added a crude tool now in the Smith Institute, Stirling. This was found in blue clay in the bed of the Forth when the foundations were being prepared for the new bridge at Stirling (Fig. 65. no. 3). It is made from a large portion of the beam and two tines splaying from it in opposite directions; the point of one is treated similarly to that in the specimen from Causewayhead, and the other is broken, perhaps by wear.

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[1] Morris, 1898, p. 59.

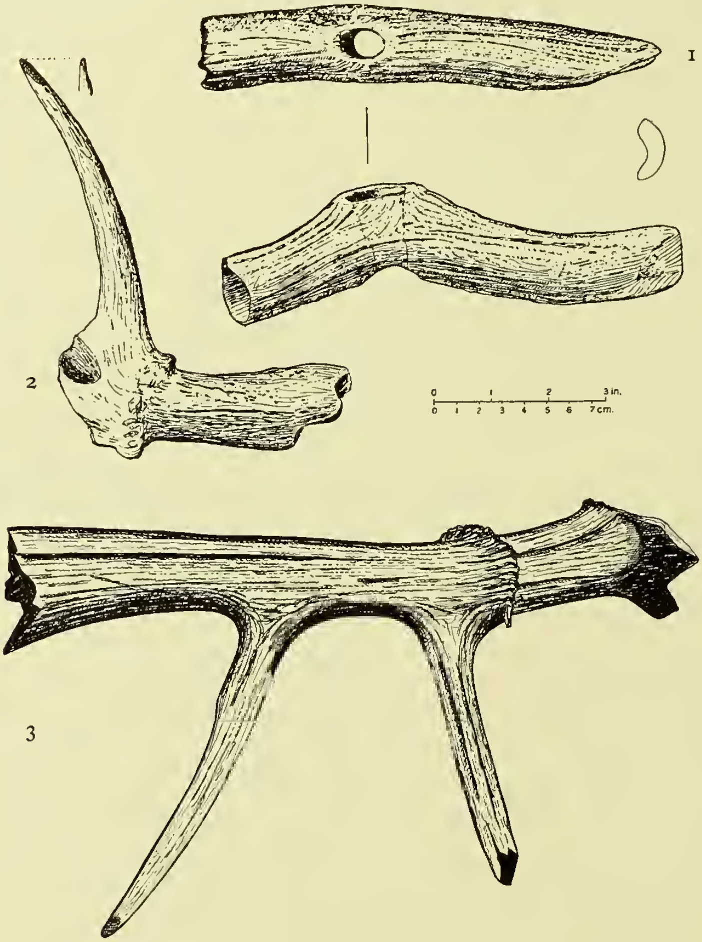

Fig. 65. Red deer antler implements found in the carse-clay of the Forth around Stirling. No. 1, from Meiklewood, Gargunnock (after Childe, 1935); no. 2, from Causewayhead (after Munro, 1899); no. 3, from Stirling Bridge.

A small perforated adze-like object (Fig. 66), broken across the hole, acquired by the Smith Institute as a find from the carse-clay at Grangemouth, may well be one of the missing red deer antler tools reported long ago from the estuarine clays of the Carse of Stirling.

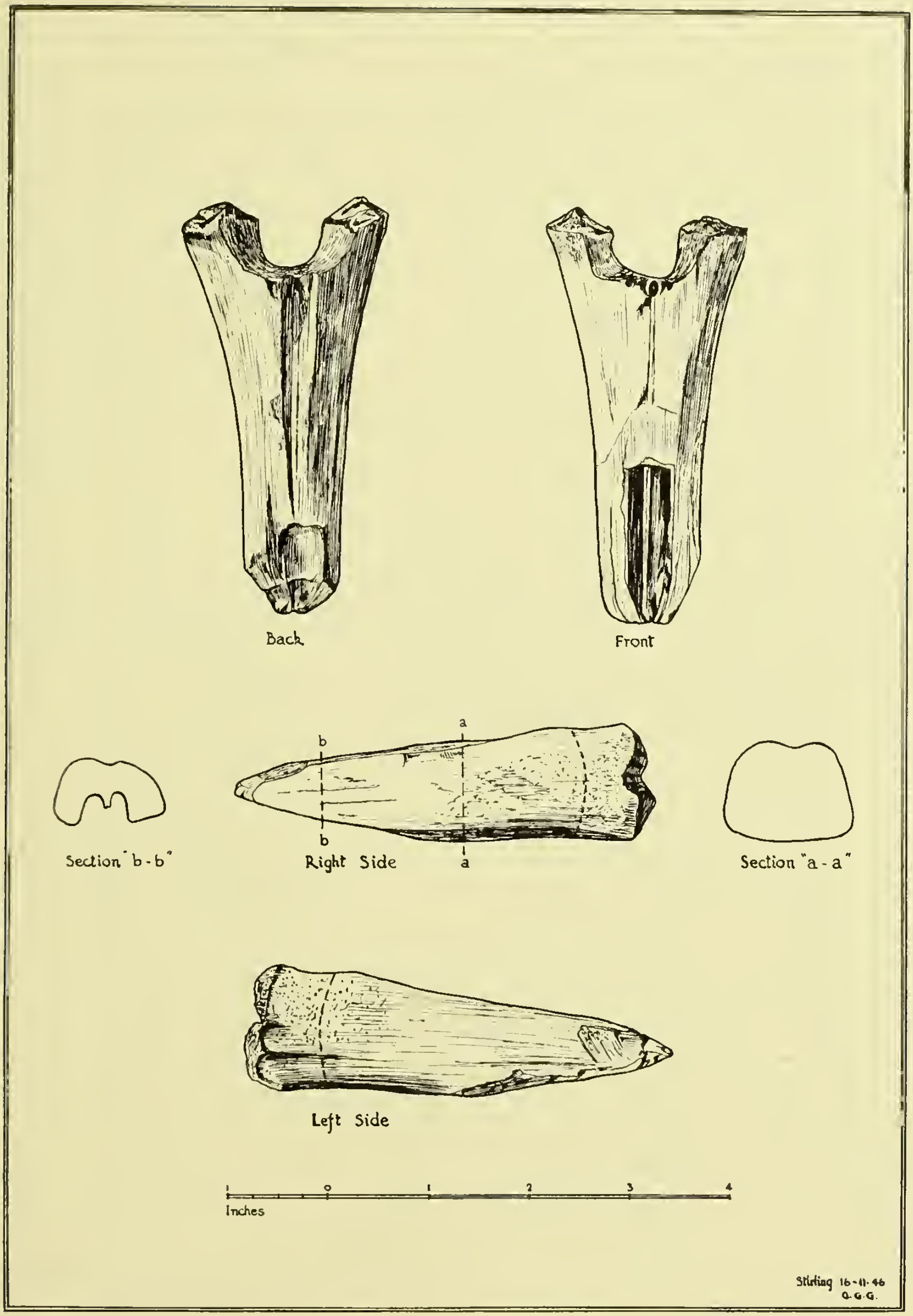

FIG. 66. Tool made of red deer antler, supposedly from the carse-clay of the Forth at Grangemouth.

Of the specimens illustrated here, at least the perforated tool from Woodyett, Meiklewood (Fig. 65, no. 1), is typical, and it has many counterparts from sites along the strand-lines of the Litorina Sea of the Baltic area.

West of the narrow strait, between Abbey Craig in the north and Stirling Castle Rock in the south (see Pl. II *a*, and map, Fig. 58), there lay during the invasion of the contemporary Early Post-Glacial sea a considerable tidal basin below the Gargunnock Hills to the south and the high ground between Forth and Teith to the north. The situation of the skeletal remains shows that huge whales were frequently stranded on the shores of this basin. These would provide abundant supplies to food-collectors who had pushed beyond the contemporary enlarged lower reaches of the Forth estuary. That some took advantage of these casualties is indicated by the artifacts which have been found in association with the animal bones. These adze-like tools were long ago interpreted as implements for removing the blubber and flesh from the carcasses of the stranded whales.[1] An admirable recent article[2] mentions the examples from the Forth estuary. It goes on to refer to their prehistoric equivalents, which have been found associated with the remains of whales in deposits of the Litorina Sea in the Baltic area, and to call attention to comparable bone and iron blubber-mattocks.

Such adventitious food-supplies as whales caught by a falling tide could not, of course, have been the mainstay even of straggling bands. Shell-fish, however, could be relied upon, together with fish and wildfowl. We cannot decide whether these folk hunted deer in this region or merely used shed antlers. Stone tools must have been used in the cutting and fashioning of stag-horn, and systematic investigations should lead to the discovery of examples. In this regard it is important to observe that in Early Post-Glacial times the Carse of Stirling would be similar to those fenlands in which the Baltic Forest cultures developed, and by which their elements were brought into Britain. It must be emphasized that in Scotland only the Tay estuary provides equal opportunities for the dating of remains by pollen-analysis supported by geological and faunal factors.

Pollen-analysis, even without additional evidence, satisfactorily demonstrates that the whale remains and the associated relics of man from the Carse of Stirling are referable to the Atlantic climatic phase (p. 72). The correlation of its results with the geological and faunal evidence confirms this, as reference to Chapter III will readily show. That whales could have swum so far up the tidal estuary argues that the Early Post-Glacial marine transgression was well developed. Hence there cannot be any great disparity in age between the implements associated with the remains of whales and the shell-refuse found stratified on the south bank of the Avon river at Inveravon and Polmonthill. Later than the true Early Larnian, the antler implements should, however, certainly be regarded as contemporary with a phase of the Late Larnian developed on the shores of the North Channel during the submergence. Considered broadly, therefore, in terms of Baltic chronology, like the shell-refuse of the Avon and the Lower Halstow Mesolithic industry of Kent (pp. 119–21), these antler tools from the carse-clays of Forth belong to Forest Culture Period III which witnessed the rise of the Ertebølle industries along the shores of the Litorina Sea.

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[1] Turner, 1889.

[2] Clark, 1947, pp. 84–104.

4. THE FIRTH OF TAY

In the Firth of Tay the traces of man have been recorded from deposits which, as in the Carse of Stirling and on the coasts of the Firth of Clyde, register the transgression of the Early Post-Glacial sea. There exist accurate accounts of two discoveries associated with the raised beach. This is, of course, the counterpart of the relic-yielding formation in south-western Scotland, and the equivalent of the estuarine clays farther up the Tay and also of the Forth valley.

Both finds are due to the hazard of utilitarian excavations. The first was made in 1878 on the promontory known as the Stannergate, two miles east of Dundee,[1] the second in 1885 at Camphill, Broughty Ferry, three miles farther east.[2]

Flint-knapping was practised at the two places, but the true character of the industry cannot be ascertained. As regards the first site, a few paltry surviving flints have been located only recently; in the case of the second only a record exists. Whatever these industries, however, they were contemporary with some Larnian stage on the coasts of the North Channel. On stratigraphy these vestiges of occupation and industry on the shores of the Firth of Tay are also of an age with, and the equivalents of, the tools found with the bones of whale in the Forth valley. This is confirmed by the pollen-analysis of the peat which, it will be remembered, underlies and overlies the estuarine clays of the lower Tay basin (pp. 71–72), and which locally rests under the correlative raised-beach deposits.

[1] Mathewson, 1879.

[2] Hutcheson, 1886.

(A) STANNERGATE

Here, between the firth and the railway, a section and archaeological sequence were disclosed very similar to those which at Dalaruan, Campbeltown, gave the first clue to the antiquity of the flint industries of Kintyre (above, pp. 140–4). For at Stannergate were found stone cists containing human bones and Beaker pottery. Exactly beneath, at a depth of about 8 feet, abundant refuse of occupation was found upon the gravel resting on the rock. The surface of this was noted to lie at a height of 30 feet above sea-level. Better than any explanation, the following section (tabulated from below upwards) demonstrates that the Bronze Age remains and kitchen-midden are quite unconnected:

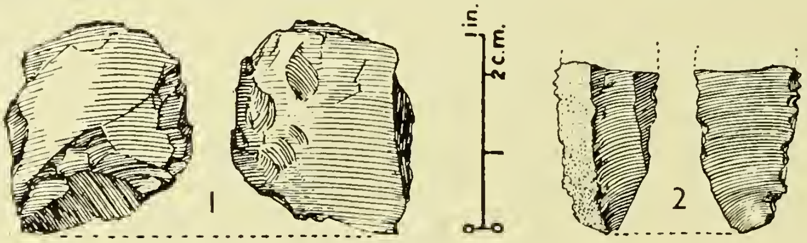

Fig. 67. Flints from the Stannergate, Dundee.

	Ft.
4. Earth in which cists were found	4–5
3. Undisturbed earth	7–8
2. Kitchen-midden	1–3
1. Gravel of raised beach, resting on rock	1–2
Total thickness	13–18

The refuse was found to consist of shells of cockles, mussels, periwinkles, whelks, and limpets, most of which were broken; artificially split animal bones, one bearing cuts made with a sharp instrument; and tines of red deer antler. Charcoal was common, and in the centre of the midden there lay a large burnt hearth-stone propped up on the subjacent gravel by smaller stones.

The fact that the midden measured at least 100 feet by 60 feet points to a fairly long occupation during the Atlantic climatic phase when the sea stood higher than now. Thinning towards the water, the shells and charcoal were seen to be interstratified with sand and gravel in such a manner as to indicate the action of waves upon the shore encampment.

A few brown-stained flint artifacts, associated with the midden, and samples of the refuse are preserved by the Dundee Naturalists' Society in University College, Dundee. Specimens of struck raw material and the bulbar end of a fine but characterless blade are figured as the best of a poor clutch (Fig. 67). It is obvious that these are not typical enough to be assigned to any one culture.

(B) BROUGHTY FERRY

The excavations at Camphill were carried out at a point 50 feet above sea-level on the eastern slope of Forthill, about half a mile south of the railway station. They revealed a more comprehensive section than that bared at Stannergate, thus demonstrating that even within a short distance conditions were somewhat different. The relics of man were disclosed at a considerable depth in a well-defined black band between deposits of the Early Post-Glacial raised beach. The surface of these marine beds was broached about 4 feet below the top-soil, and therefore over 40 feet above modern sea-level. This indicates that along this exposed part of the coast the sea encroached considerably on the land during the Atlantic climatic phase. The accompanying sketch (Fig. 68) shows the order of the layers.

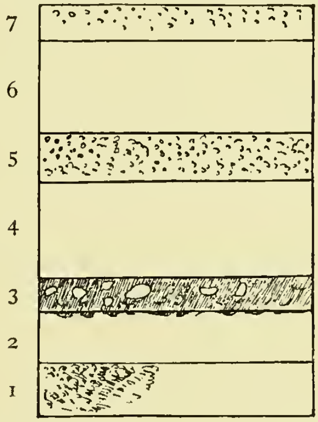

FIG. 68. Section in the Camphill deposit, Broughty Ferry, Angus. (After Hutcheson, 1886.)

Food-refuse was absent, but the discovery was made of about 150 flint artifacts, fire-shattered stones, charred wood, and possible vestiges of bone. Most regrettably, all trace of the flints has been lost. However, it is understood that these were patinated and included flakes and blades, one with irregular and minute serrations along an edge, evidently due to wear. Cores, chips, and pieces were also present. The small size of the cores attracted the attention of the finder. Undoubtedly the raw material used here and at Stannergate was borne into the locality by ice-drifts from an offshore flint-bearing bed east of the Buchan coast.

Over the area of its exposure the relic-containing black band (Deposit 3) formed a patch about 1 foot thick, 70 feet long, and 40 feet wide. The flints occurred throughout, but most lay at the bottom. It would appear, therefore, that here was an encampment and working-floor which represented a sojourn upon the top of the contemporary beach (Deposits 1 and 2) during the Atlantic climatic phase. Situated near the high-level Post-Glacial sea, probably during its decline, the site was washed by an exceptional tide which disturbed the refuse of occupation and covered it with sand (Deposit 4). The overlying bed seems to have been correctly interpreted as an old land-surface (Deposit 5). In all likelihood of Sub-Boreal age, it was formed when the process of emergence was completed. It was in turn covered with the surface-washings (Deposit 6) from the hill during the Sub-Atlantic climatic phase, and in time becoming stabilized it was capped with the vegetable soil (Deposit 7).

5. THE NORTH-EAST AND NORTH

(A) DEESIDE

While not numerous, the heavily patinated flints associated with the raised beach in south-west Scotland (Fig. 56) indicate that during the expansion of the Early Post-Glacial sea the Larnian culture had extended far beyond the cradle of its development on the Irish coasts of the North Channel. But its inland equivalent, as represented on Tweedside, though gradually developing, could hardly have spread rapidly in the North Sea basin at this time. Owing to the distension of the great estuaries and the presence of forests, land-routes would long remain difficult. Not until the width of the estuaries had been considerably reduced by the subsequent emergence, and the forests had decreased under prevailing climatic conditions, could any important migration by internal routes have been carried north of the Forth.

If one may judge from a few discoveries, elements of the hybrid culture developed on Creswellian vestiges in south-west Scotland had nevertheless become fairly widespread by the time the conditions of the Atlantic climatic phase had generally given place to Sub-Boreal. Yet, so far, only one series which shows anything like full typological affinities with the industries of the Tweed valley and the English north country has been assembled in the territory beyond the Forth in the North Sea drainage. This comes from both banks of the River Dee, in Kincardineshire and Aberdeenshire, around Banchory. Other arrays, which have been collected in sandy areas, consist merely of handfuls of stone artifacts. These are enough, however, to suggest that thorough investigations would be rewarded, for they illustrate the northward extension of Mesolithic traditions. The most interesting in this class is that recorded from the Tentsmuir Sands at the mouth of the Firth of Tay in Fife.[1] Found in peculiar local conditions and associations on the coast, and falling, therefore, into a category somewhat different from the Banchory group, these series are examined in another chapter (below, pp. 278–83). The clutches from riparian and sandy sites are all strong in microlithic elements, but none includes any stone or bone artifact of Baltic Forest Culture type.

I. THE BIRKWOOD (BANCHORY) COLLECTION. A deposit extending diagonally across Buchan is the only native source of high-grade flint in Scotland.[2] The quality of this stone was well known to prehistoric settlers, for no county is richer in flint artifacts than Aberdeenshire, and innumerable specimens made in the grey, yellow, brown, and red varieties of Buchan have been found at many inland and coastal stations over a wide area in the north-east. To the excellence of this material is certainly due the fine workmanship of the edge-retouched tools from this region. In none does this appear better than in the earliest types of implements which have been recovered. These are the output of microlith-producing industries.

The most important groups of microliths made in the many-hued Buchan flint are those from the neighbourhood of Birkwood on the right or south bank of the River Dee near Banchory, on the fringe of the Midland Valley, but just inside the Highland area. They are included in a large collection which resulted from searches commenced in 1906 and carried on for thirty-five years. The assemblage includes specimens which, when brought to notice in 1912,[3] first made widely known the existence in Scotland of microliths similar to those found in England and on the Continent.

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[1] Lacaille, 1944, pp. 5–16.

[2] Jamieson, 1865 (*b*), pp. 240–1; Anderson, 1896, p. 348; Callander, 1930, p. 213.

[3] H. M. L. Paterson, 1912, 1913.

The Birkwood Collection, now preserved in the National Museum of Antiquities at Edinburgh, is mainly the result of the gleaning of ploughed fields on two terraces.[1] These features are well defined between the confluence of the Water of Feugh and the River Dee above Beltcraigs, and Knappach, a distance of two miles. Downstream they become wider and less discernible. The top of the perfectly flat low terrace stands 26 feet above the main river (Pl. VI *a*). About 30 feet higher, the surface of the next terrace, the fluvio-glacial formation, is undulating and escarpated. A methodical excavation in the low terrace near Birkwood disclosed its fluviatile composition, and an occupation-layer which yielded oak charcoal

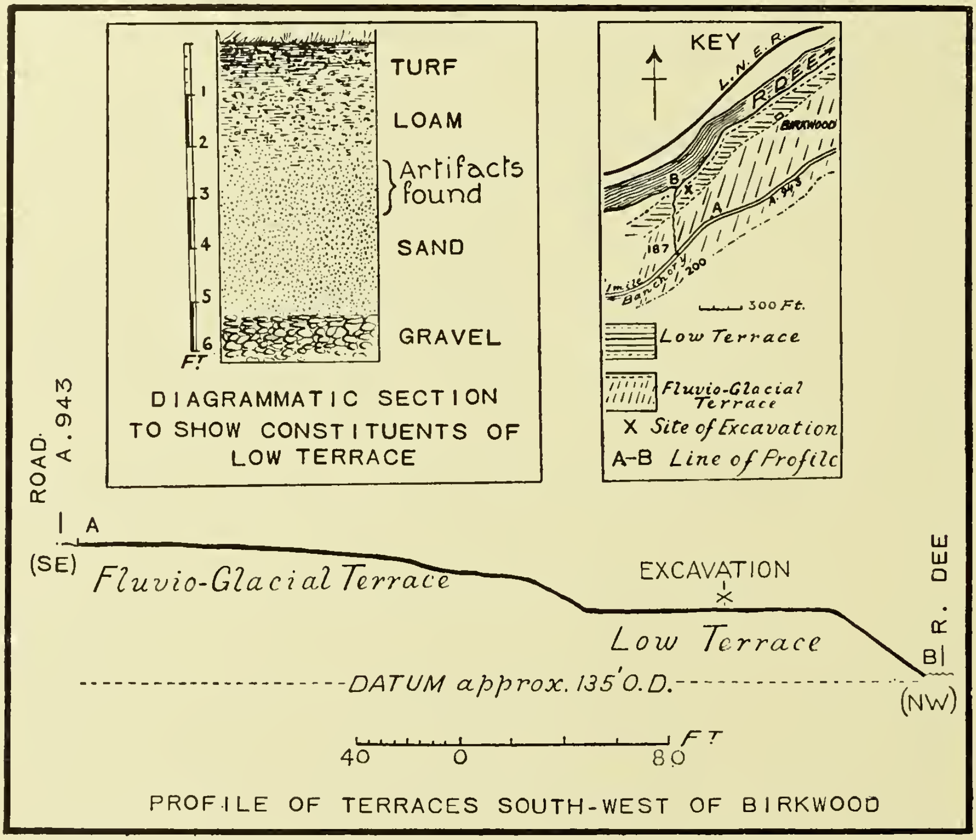

Fig. 69. Plan and section of site excavated in the low river terrace of the Dee at Birkwood, Banchory, Kincardineshire. (After Paterson and Lacaille, 1936.)

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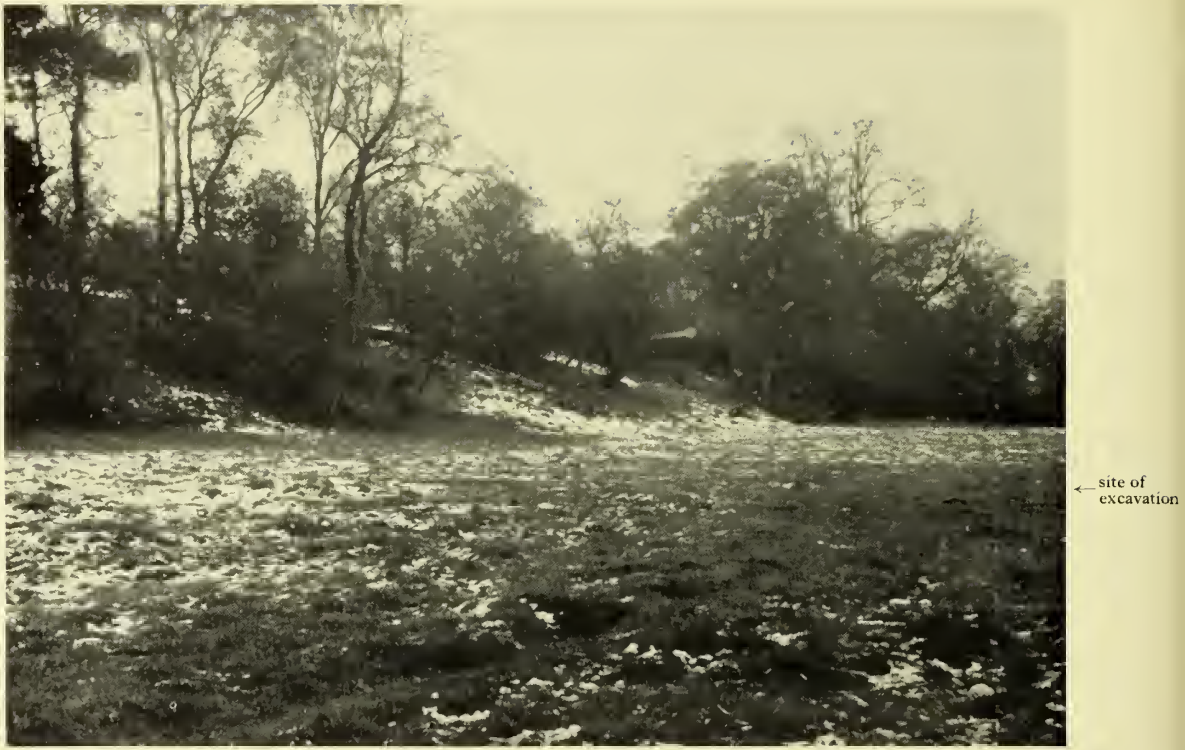
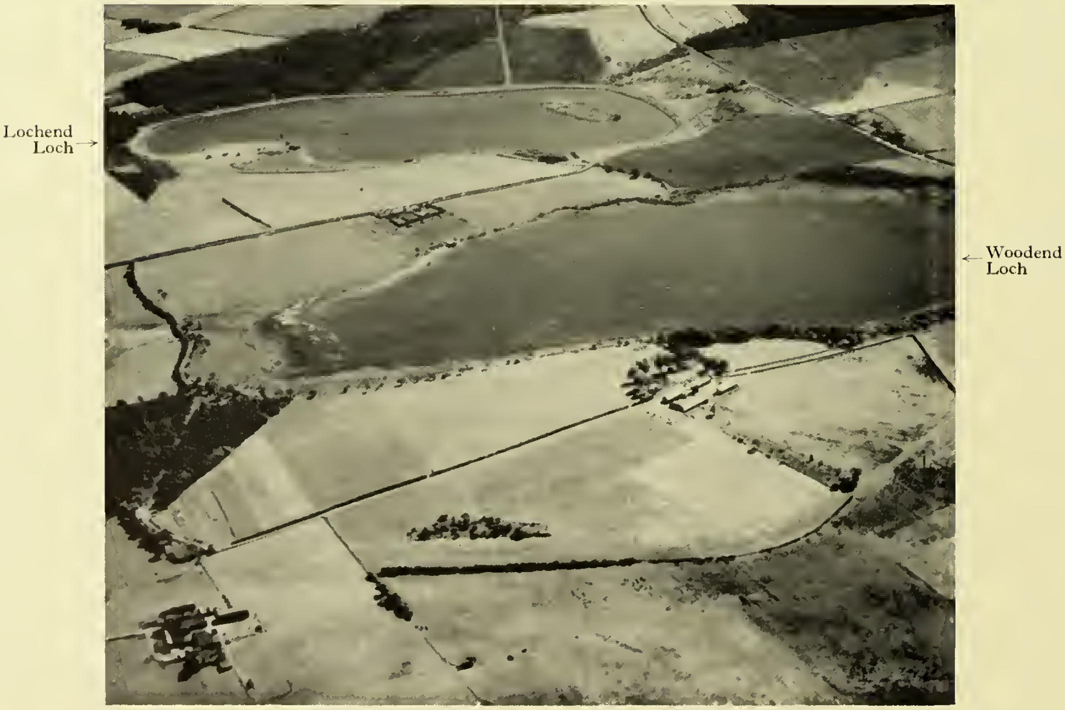
[1] Paterson and Lacaille, 1936.



(*a*) LOW RIVER TERRACE OF THE DEE AT BIRKWOOD, BANCHORY, KINCARDINESHIRE
Site of excavation in right central foreground.



(*b*) AERIAL VIEW, FROM THE NORTH OF WOODEND LOCH, OLD MONKLAND PARISH, NEAR COATBRIDGE, LANARKSHIRE
The Stone Age site lies on the shore of the loch in the central foreground.
(*After Davidson, Phemister, and Lacaille, 1949, from a photograph by J. K. St. Joseph, Cambridge.*)

and artifacts of flint, schistose grit, and quartz, some fire-crackled, on top of sand resting upon richer gravel. Fig. 69 shows the section, the relation of the site to the river, and the profile of the terraces.

The relics from the trench include flakes, blades, scrapers, micro-burins, and cores, exactly like those from the surface of the low and fluvio-glacial terraces. Down valley from the Water of Feugh the grounds of Beltcraigs, Birkwood, Maryfield, and Knappach have contributed their quota to a collection rich in microliths. Several are tiny and many made by micro-burin technique. Triangles (Fig. 70, nos. 1–8), and segments (nos. 9–11) occur. Pointed implements are common (as nos. 12–15), a few are wide and obliquely trimmed (as nos. 16–18, the last slightly concave). Among the microlithic types the most numerous are narrow, pointed blades battered on one or more edges (e.g. nos. 19–22), small rods (e.g. nos. 23–25), and implements as sharply pointed as needles (e.g. no. 26). Notched flakes (e.g. nos. 27, 28), consisting of material being made into microlithic forms, and micro-burins (e.g. nos. 29–31), which were waste from their production, are well represented, as also are sundry small implements trimmed in microlithic style (e.g. no. 32).

Thus, Deeside produced many microlithic types identical with those manufactured in the Tweed basin, as well as some of the broad-blade forms encountered in the industry of Tentsmuir Sands, which will be described later (pp. 278–81). The needs of the Deeside communities were, however, met mainly by fine untreated blades (Fig. 70, nos. 33–35). Nevertheless, in the collection retouched examples are present (as nos. 36, 37) and compound scrapers (e.g. no. 38). Various gravers, plain and multi-faceted (e.g. nos. 39–41), even flat (*burin plan*) (no. 41), and waste graver-spalls (no. 42) are reminders of a remote Upper Palaeolithic ancestry. This aspect is enhanced by well-dressed scrapers on crusted primary flakes (e.g. nos. 43, 44), by the character of the numerous cores (nos. 45–47), many being edge-retouched to serve as scrapers (nos. 46, 47), and by core-trimmings (e.g. no. 48). The scarcity of types usually associated with Neolithic or Bronze workmanship also emphasizes this Upper Palaeolithic aspect. A small saw (no. 49) is illustrated as exceptional.

The economy of the microlith manufacturers in the Dee valley must have been like that of the food-collecting bands on the banks of the Tweed. Very similar conditions would of course exist in both regions. A little more, however, can be learned of the Deeside folk from the discoveries inside the

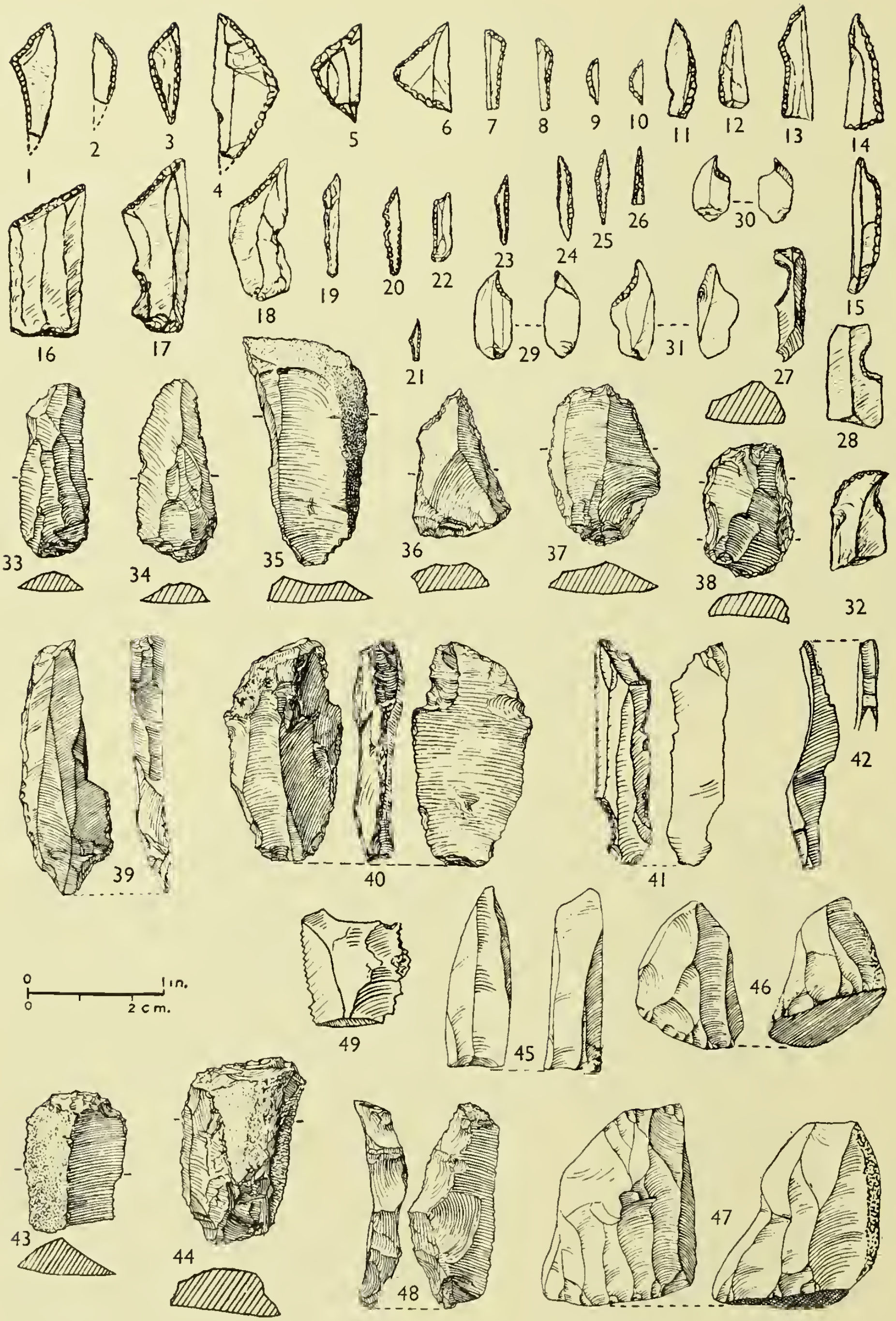


Fig. 70. Flint industry from Deeside, around Birkwood, Banchory. (Nos. 1–32, 39, 41–42, 45–47, and 49 after Paterson and Lacaille, 1936.)

low terrace. Thus, it is inferred that these producers of implements of Mesolithic facies encamped sometimes on the fluvio-glacial terrace, and sometimes on the contemporary flood-plain. This formation and its relics of human occupation are now, of course, buried under alluvium, subsequently deposited, while the implements left on the surface of the older fluvio-glacial terrace remain unburied or quite near grass level, according to circumstances such as agricultural operations. The occurrence of artifacts at slightly varying levels in the sediments of the low terrace may be explained by the probability that in favourable conditions the food-collectors squatted near the river. From choice, or owing to floods, they would retire to the higher ground, but they would return to the bank in better season. During the intervals their implements were covered with water-borne sand. Those artifacts which were found deep down suggest that they may date back quite far, possibly to late in the Atlantic climatic phase. Heavy and frequent rains would then still prevail and cause great spates which were responsible for considerable erosion and deposition.

2. INCHMARLO COTTAGE. Flints similar to those collected on the right bank of the Dee have been found on the left, or Aberdeenshire, bank near Banchory. Specimens have been picked up opposite Birkwood, and they have been taken from the scrapings of rabbit-burrows in the low terrace and in the scarps against which it is banked. A selection of typical products thus exposed at Inchmarlo Cottage, two miles upstream, has been illustrated.[1] The selection shows a worn blade, a core, the fragment of a steeply edge-blunted blade, and a characteristically dressed, small triangle.

Owing to its situation the Banchory district, which is within the Highland border and seventeen miles from the coast, could not have been reached by man before the Early Post-Glacial period was well advanced. This could hardly have been until the process of land recovery was under way and was reducing the greater estuaries during the later part of the Atlantic climatic phase. The locality lies, of course, in a region which, like the Tweed valley, had not been subjected to any major disturbance since the melting of the last glaciers. Hence, as most of man's stations around Banchory were situated well above the river on ground so long unaffected by changes, the absence of a stratified sequence is not surprising.

The fact that long and careful search of the surface around Banchory has added only rare post-Mesolithic forms to the Birkwood Collection is not without significance. Some of these implements, indeed, are trimmed in microlithic style.[1] This would point to the persistence of the old food-collecting economy, and would at least suggest contacts with exponents of more developed industry. In this respect, however, it is remarkable that so far no archaic tool-types have been reported from the links extending north-easterly for many miles between Aberdeen and Belhelvie, or from the sand-dunes on the banks of the Ythan, where shell-mounds and flint implements have been observed.[2] This is important, because such types of artifacts have not been reported from similar stretches between Aberdeen and the Firth of Tay opposite Tentsmuir, though at these places we should expect indications of the northward progress of the Mesolithic facies.

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[1] Lacaille, 1944, p. 13.

No sandy area along the Aberdeenshire coast beyond the Ythan is known to have produced anything resembling the outstanding components of the Birkwood Collection. Much farther north, however, some groups and odd artifacts of stone which betray an ancient ancestry have been found. The character and associations of these objects will be dealt with later (pp. 266–74).

(B) VARIOUS DISCOVERIES

In the Peterhead Museum a few rolled flakes and thick parallel-sided blades of hard sandstone grit may be compared with Larnian remains from the south-west (Fig. 56). These artifacts are said to have been washed out of the Early Post-Glacial raised beach not far from the town. If this could be proved, it would denote an extension of the Mesolithic culture which, as an east-coast equivalent of the Larnian, is represented by the flints and occupation-refuse from deposits of the same formation at the Stannergate and at Broughty Ferry (above, pp. 175–8).

There is in the Hunterian Museum in the University of Glasgow a fine mineralized bone point furnished with a single row of four recurved barbs (Fig. 71). Labelled as found in a peat-moss at Glenavon, Banffshire, it bears a general resemblance to certain forms produced in the Obanian industries of Oronsay (Fig. 97, no. 5, and pp. 225–7), which have already been likened to some specimens from the Baltic region. Although the lower part is missing, this piece of fishing-tackle is almost a small version of a classic Maglemosean type from Løjesmolle, Rerslev, in Zealand.[3] The full circumstances of the discovery may never be known, but it is tempting to see in this Scottish example an illustration of the spread of the Baltic tradition evident in the antler implements from the carse-clays of Forth. As such it would be a link between these and other, but presumably much later, bone-work from sites in the extreme north.

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[1] Paterson and Lacaille, 1936, p. 424.

[2] Jamieson, 1865 (*a*), p. 194.

[3] Clark, 1936 (*a*), Type 9, Pl. V, no. 4, and p. 117.

A discovery during the war years at Freswick Bay, Caithness, showed that strains of a primitive culture were carried to the extreme north. Several rolled and patinated flint artifacts were recovered here about 100 yards inland; they were found in an argillaceous deposit in the upper part of the Early Post-Glacial raised beach, the top standing at a low elevation (Fig. 14 and p. 55). Rudimentary and similar to a Late Larnian, the Freswick Bay group consists of coarse flakes (some edge-worn), cores, and a few retouched scrapers (Fig. 72, nos. 5–7). The containing bed was revealed beneath an overburden upon which there rested shell-refuse with potsherds, bone tools, and unaltered flint implements. These will be considered in Chapter IX (pp. 266–70).

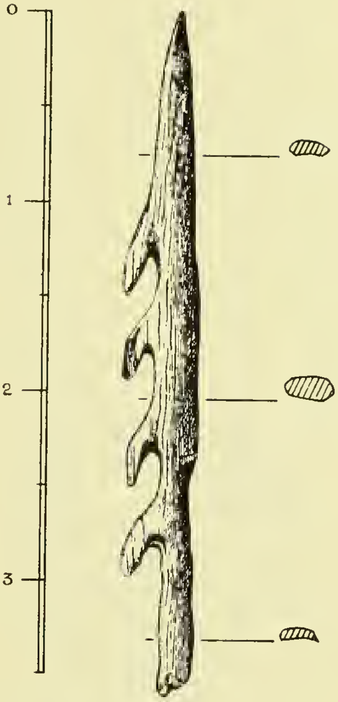

Fig. 71. Barbed bone point from Glenavon, Banffshire. (Drawing by W. J. McCallien.)

6. ROUTES FROM EAST TO WEST

(A) THE BIGGAR GAP

We must now consider the routes by which Mesolithic strains passed from the Tweed valley to the south-western seaboard of Scotland. It will be remembered that the earliest spread of Tardenoisian and Baltic elements from south-east Scotland is indicated by some characteristic artifacts mixed with normal Early Larnian products recovered from deposits of Atlantic age in Kintyre (pp. 148–9).

It cannot yet be shown that one obviously possible route from the North Sea area to the south-west, by way of the Lothians, Forth basin, and the Central Plain, was used. Scattered finds in Berwickshire, in sandy expanses on the south coast of the Firth of Forth, and in the Meadows, Edinburgh,

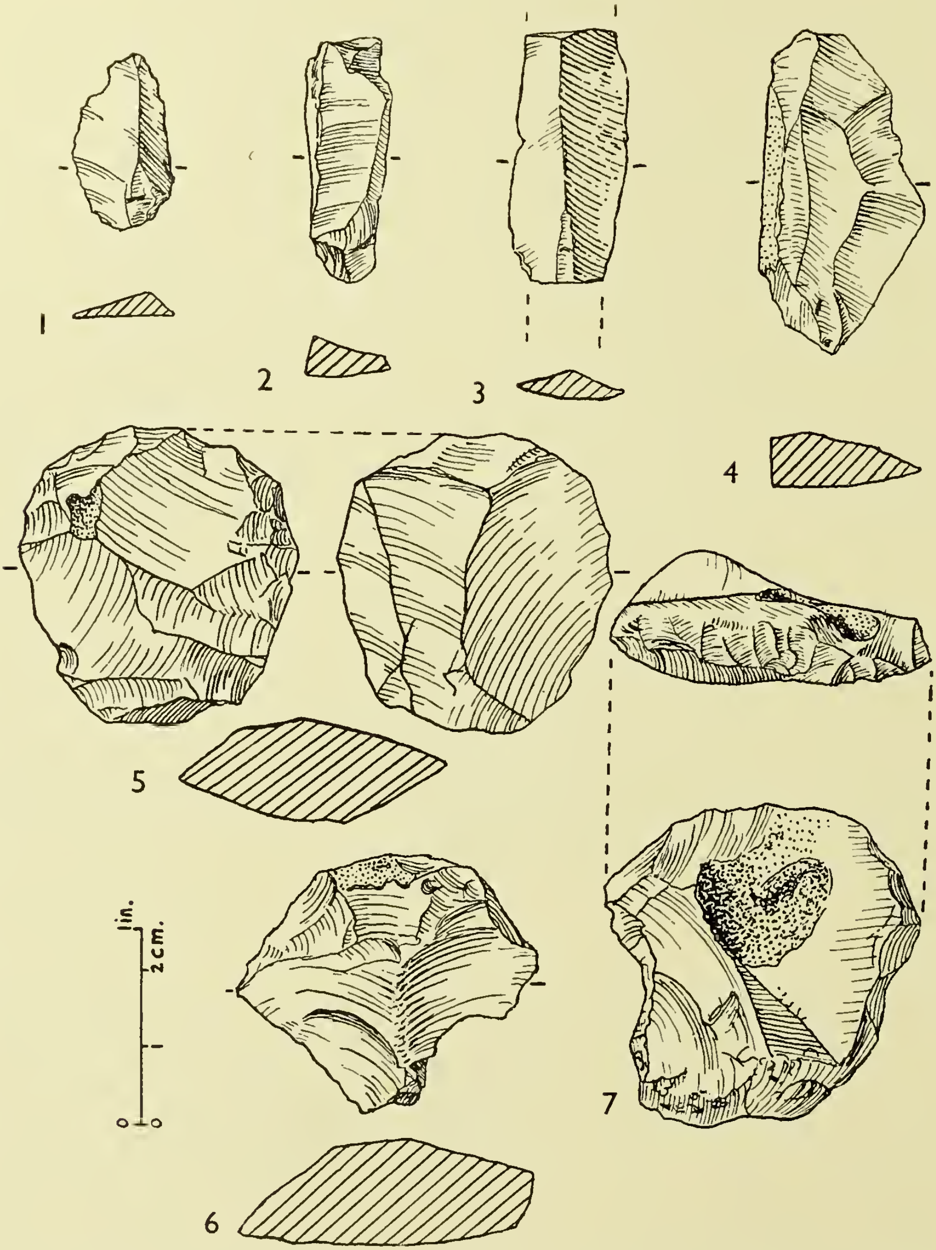

FIG. 72. Flints from deposit underlying a kitchen-midden at Freswick Bay, Caithness.

point only to the gradual northward progress of exponents of the Tweedside industrial facies. Yet, beyond, there lies a potential field of inquiry in the wide tract between Forth and Clyde. On the other hand, there is evidence to support the opinion that one route by which early migrants filtered from the east into the west was the Biggar Gap. This link between Tweeddale[1] and Clydesdale is a defile about seven miles long and a quarter of a mile broad between hills to north and south. Its floor is a flat, declining imperceptibly from west to east between the 650-foot contours. The Biggar Water in its sluggish course from a little east of Coulter on the Clyde, in Lanarkshire, to its confluence with the Tweed at Drummelzier, in Peebleshire, flows in this defile, and the Biggar Gap thus belongs properly to the North Sea drainage. It was probably once part of the valley of an easterly flowing predecessor of the Clyde, for only a narrow plain at the western end, instead of a ridge or hill, forms the watershed. The origin of this parting has been ascribed to the recession of two valleys and to the subsequent widening of the breach by atmospheric waste and the sea.[2] Before man reached Scotland in the Early Post-Glacial period the Biggar Gap had been finally prepared for him by powerful natural agencies. It was a col through which in Late-Glacial times the remnant glaciers continued to discharge their melt-waters into the Tweed valley, even after this had been freed of ice towards the end of the Second Period of Retreat from the limits of the New Drift.[3]

(B) STONE INDUSTRIES IN CLYDESDALE

Downstream, from opposite the Biggar Gap to the estuary proper below Glasgow, the Clyde valley would offer to food-collecting bands an environment and attractions like those of the Tweed valley. It is regrettable, therefore, that the search for relics of Mesolithic facies has not been carried far in a region of such possibilities. Notwithstanding, a few significant groups have been found in Clydesdale, and these can certainly be linked with series from Tweedside. The most comprehensive sets from the west side of the watershed include Tardenoisian microlithic forms. But these, in common with their counterparts from the east side, constitute but a small part of the industry represented.

1. THE UPPER WARD OF LANARKSHIRE. Clutches of stone artifacts have been recovered from the haughs on five farms in the Upper Ward of

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[1] i.e. the upper reaches of the Tweed, above Melrose.

[2] A. Geikie, 1901, pp. 377–8.

[3] Charlesworth, 1926 (*b*), pp. 48–49.

Lanarkshire where the Biggar Gap opens into Clydesdale (see distribution map, Fig. 73). In downstream order over a distance of five miles, from east to north-north-west, the sites are: Eastfield and Annieston on the left bank of Clyde in Symington parish; on the right bank in Covington parish west of Law Farm, and west of Parkhouse in the parish of Libberton; Bagmoors on the left bank in Pettinain parish. The largest and most comprehensive assemblage comes from the lands of Eastfield, the Clydesdale site nearest the River Tweed.

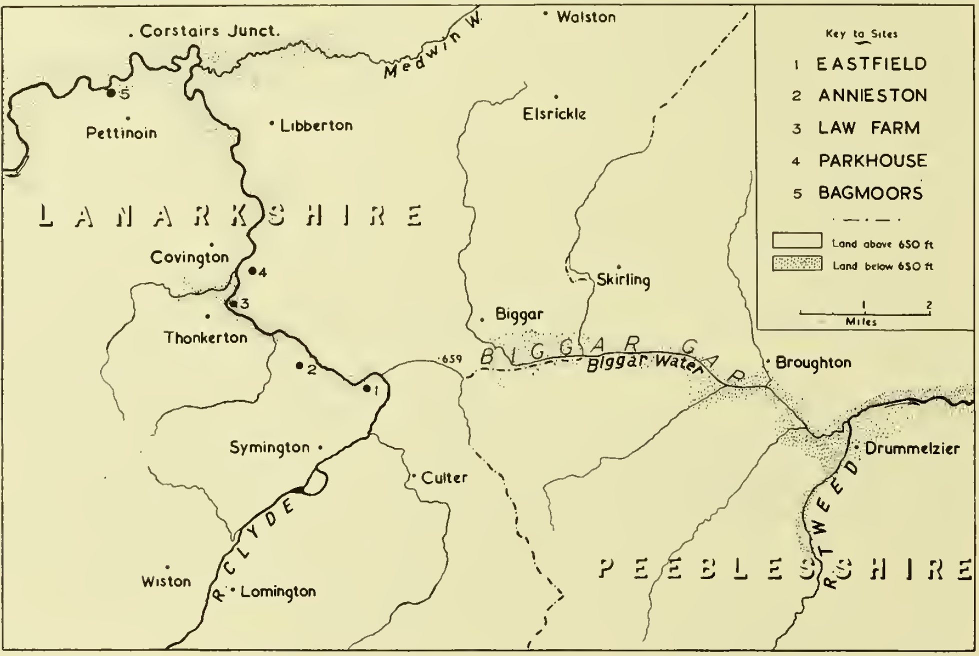

FIG. 73. Map showing the distribution of stone industries in Clydesdale opposite the Biggar Gap.

Most of the materials which served for the manufacture of implements at these places were of very poor quality. The commonest were pebbles of brown and green chert and jaspilite from the river and irregular lumps from the drifts. At Eastfield, however, the green chert seems to have been selected, and some flint was used. None of the artifacts is patinated, though some appear to be more weathered than others. These features help to emphasize the resemblance between the Clydesdale series and the main output of the Tweedside industries.

Definable forms later than Mesolithic are absent from the Clydesdale series, the constituents of which can all be matched repeatedly by specimens from Tweedside. In common with most of these, they owe their exposure to the plough. Since the various lots are largely composed of the principal oldest types of prehistoric antiquities so far found in Scotland, some of them may be the relics of quite early Post-Glacial movements and sojourns. Still, it may be pointed out that, while Upper Palaeolithic traditions survive strongly in the flakes and blades, the appearance of many is deceptive. Their crudity is not due to very great age or to incompetent craftsmen, but to the intractability of the raw material. A flake from Bagmoors (Fig. 74, *A*) is characteristic of much of the struck stone from all sites.

Fig. 74, which shows a selection of artifacts from all the Clydesdale sites mentioned above, demonstrates that in facies the principal products of the industries are similar. Nos. 1–3 (Eastfield, Symington) and 23 (Bagmoors, Pettinain) are representative of the great variety of flakes, plain or worn from use as cutting or scraping implements. Nos. 4–6 (Eastfield) are plain, and no. 7 (Eastfield) is exceptional as a retouched specimen, the dressing consisting of oblique working at one end. Scrapers fashioned on flakes or pieces are well represented, e.g. nos. 8, 9, 11, 19 (Eastfield); no. 24 (Parkhouse, Libberton); nos. 25 and 28 (Annieston, Symington); no. 26 (Law Farm, Covington). As might be expected in a region where the raw material was of indifferent quality, core-trimmings are not uncommon. Dressed specimens occur, e.g. no. 10 (Eastfield), probably a knife to which a back was given by battering along the steep side. No. 20 (Eastfield) typifies the ordinary form detached by the knapper from cores to obtain a fresh surface. One, no. 22 (Annieston), has come away in a hinge and is worn from use at the bulbar end. With its counterparts from Tweedside (cf. Fig. 59, no. 38, above, p. 165), it further serves to show that, even as an improvised tool, the employment of the form in Scotland was not restricted to the Larnian (Mesolithic) coastal squatters and their successors. The cores, nos. 16–18 (Eastfield), are of the commonest type. A variant, no. 27 (Parkhouse), resembles some of the small cores which at Campbeltown and other sites illustrate the scarcity of raw material for the extraction of flakes and blades. So far Eastfield alone of the sites in the Upper Ward has yielded microliths. These are made in the Tardenoisian tradition, nos. 12 and 13 being minutely trimmed segments, no. 14 a micro-burin, and no. 15 a delicately trimmed awl on a truncated blade.

2. WOODEND LOCH. The banks of small lakes left in the trail of the

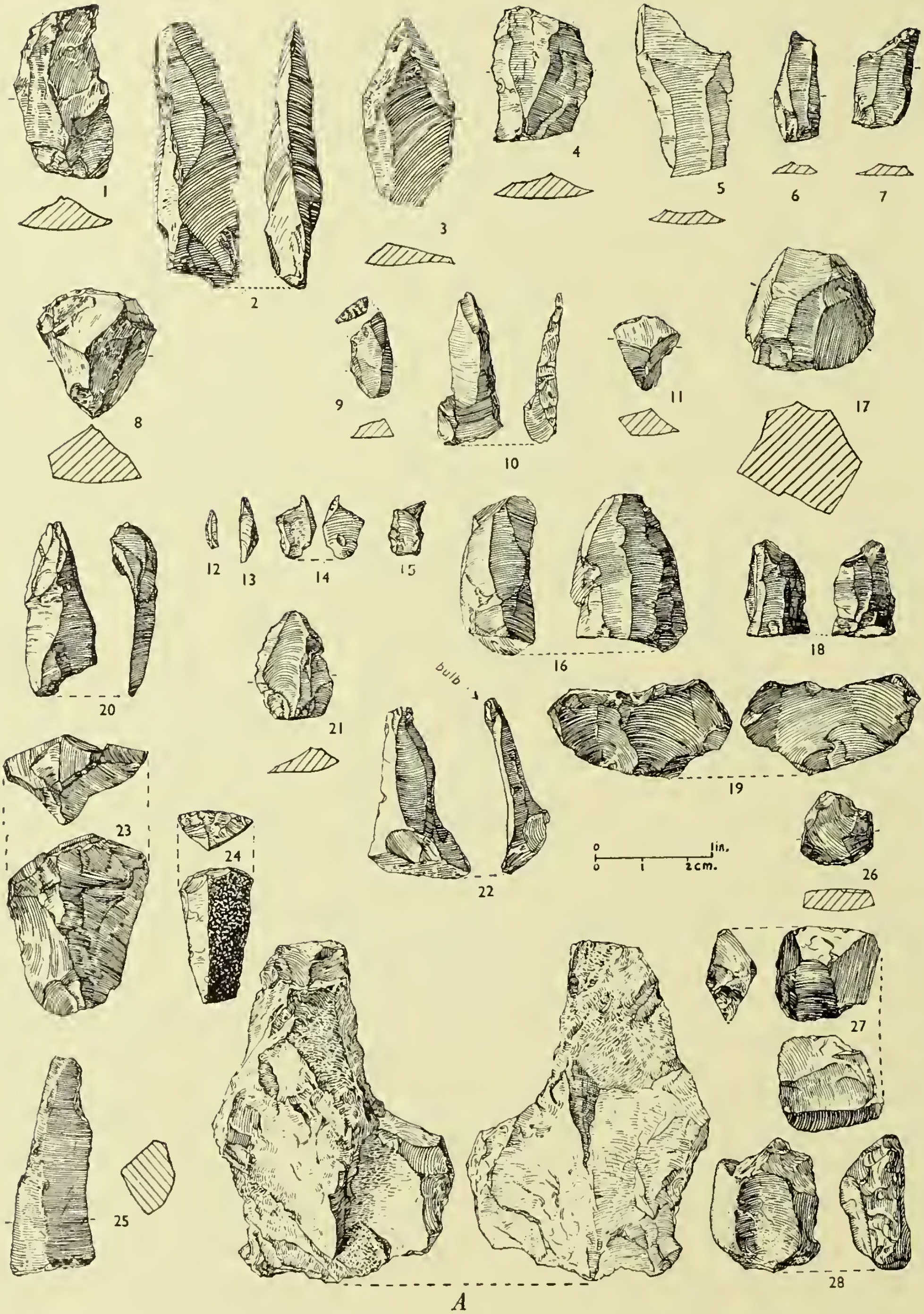

FIG. 74. Representative series of stone artifacts from sites in Clydesdale opposite the Biggar Gap. *A* and no. 23, Bagmoors, Pettinain; nos. 1–20, Eastfield, Symington; nos. 21–22, 25–28, Annieston, Symington; nos. 24 and 27, Parkhouse, Libberton; no. 26, Law Farm, Covington.

deglaciation of the Midland Valley would be attractive to small communities. In Early Post-Glacial times these waters were far more numerous in the high grounds of the Clyde basin than they are now, particularly to the north of the river between the great kame belt and Glasgow (above, pp. 34–36). On the drumlin-protected north shore of one of these lakes, Woodend Loch in the parish of Old Monkland, near Coatbridge, Lanarkshire (Pl. VI *b*), quantities of workshop chips, a few flint, and numerous chert and mudstone artifacts have been found in a few inches of peaty silt overlying boulder clay on the water's edge.[1] As Fig. 75 shows, these include forms met with on Tweedside and in Clydesdale near the Biggar Gap. Thus, despite the fact that the raw material used was mostly of poor quality, Upper Palaeolithic traditions lingered in the Woodend Loch industry. In this there occur utilized and trimmed flakes and blades (nos. 1–8), various scrapers (nos. 9–13), gravers (e.g. no. 14) and perforators (as no. 15), steeply edge-blunted blade implements (as nos. 16 and 17) with a fair sprinkling of Tardenoisian forms of non-geometric shapes (nos. 18–25), waste micro-burins (nos. 26–27), and notched blades (e.g. no. 28). Owing to the generally poor quality of the new material, cores are varied. Those figured here (nos. 29 and 30) are among the best.

A few specialized implements should be noted. Such are picks of the Larne types improvised in plunging flakes or worked in thick pieces (e.g. nos. 31 and 32), flakes with faceted butts (as no. 33), and short wide flake-tools brought to a *tranchet* edge (e.g. no. 34). These may be links with Mesolithic and somewhat later coastal industries of the south-west (below, pp. 253–63), and suggest that Woodend Loch may have long been the resort of food-collectors. On the other hand, the specialized forms may have been developed here independently in response to needs similar to those of the squatters on the seaboard. For that matter, save for the considerable element of Tardenoisian forms which link closely the Woodend Loch series with those from the Tweed valley, the aspect of the assemblages from Woodend is like that of a group from a Larnian site. Apart from this, however, the lakeside industry is important, since it belongs essentially to the inland culture which developed on Tweedside as the equivalent of the littoral Larnian of the south-west, which now appears to have flourished with little variation over the whole breadth of Scotland.

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[1] Davidson, Phemister, and Lacaille, 1949.

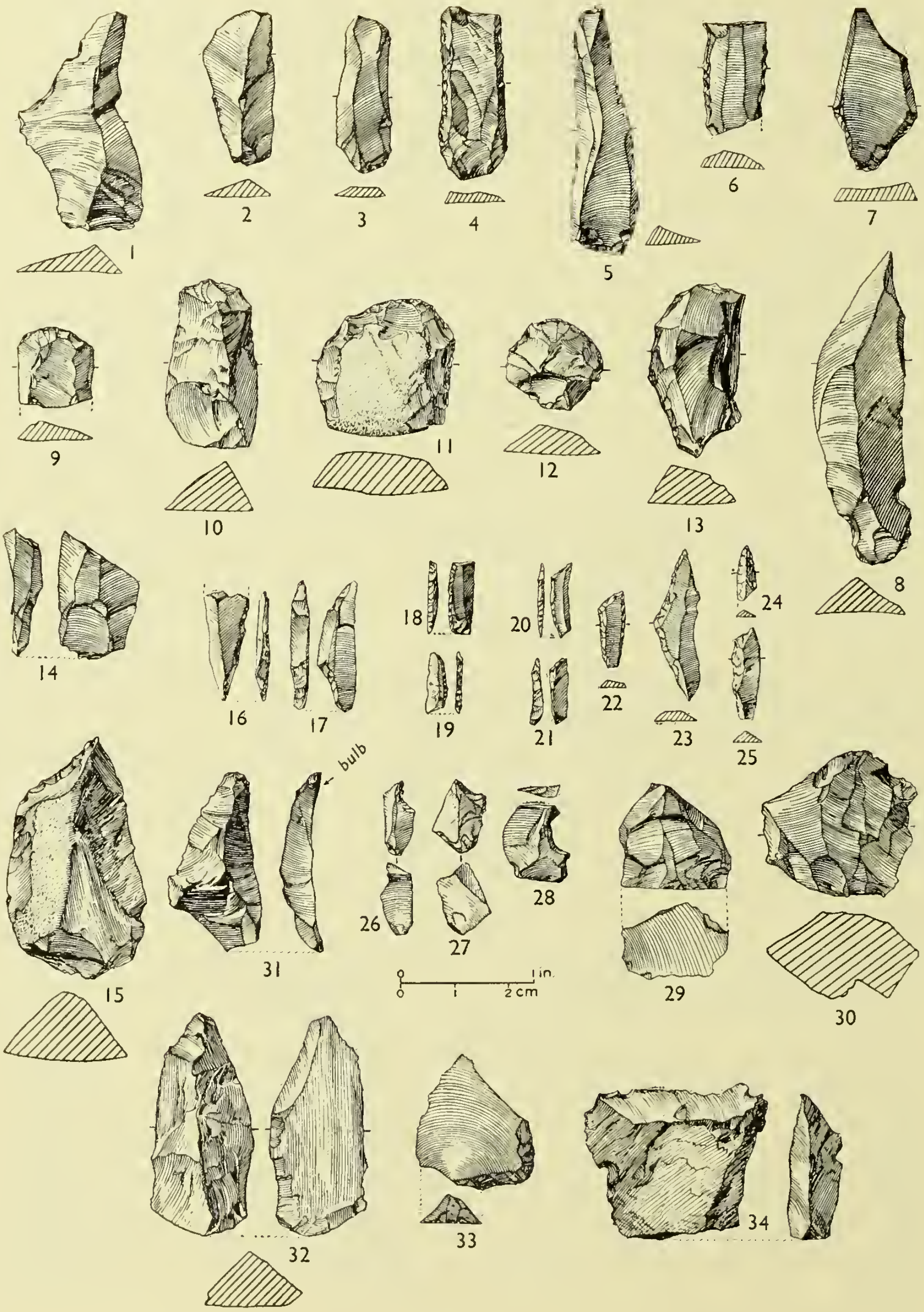

FIG. 75. Flint, chert, and mudstone industry from Woodend Loch, near Coatbridge, Lanarkshire. (After Davidson, Phemister, and Lacaille, 1949.)

So far we have no knowledge of stone-working sites between Woodend Loch and the Firth of Clyde. The question whether that lakeside station did or did not receive impulses from the south-west must therefore be regarded as of secondary importance. Of greater moment is the fact that among the strains which reached Woodend Loch, apparently from the east, those of the Tardenoisian microlithic tradition spread widely and persisted long on the western seaboard. Here they occupied a place of varying importance in the different industries which are still to be discussed. Some of these are referable to cultural growths such as Baltic and later graftings on the Larnian stock, others to ultimate developments of stone-working which may be compared with those apparently found in the North Sea basin beyond the River Dee.

(c) LOCH LOMOND

Indications of the diffusion of Baltic strains in Scotland are found in other localities. That these strains spread far and endured long is demonstrated by implements made in bony substances and in stone. Such artifacts were, of course, connected with the food-quest. They have been found principally beside coastal waters frequented by marine mammals. Such sites occur in the extreme north-east corner of the Scottish mainland, in the northern archipelagos, in the Hebrides, and even in north-east Ireland. Most belong to late contexts, and are referable to house-builders whose standards were far higher than those of small food-collecting bands living in a Mesolithic stage of cultural development. We have to look elsewhere than in the North Sea basin for some of the possible links between the early tools from the estuarine clays of the Carse of Stirling and the infinitely later implements of the more advanced people in the west.

Odd flaked stone artifacts of Baltic type have been picked up in inland localities other than the Tweed valley, but this region alone in the North Sea drainage has yielded these implements in association with other Mesolithic forms. Though want of stratigraphical data makes these sporadic finds imperfect indicators, they may nevertheless suggest how some Baltic elements spread from the region of their entry. Relatively early in the Post-Glacial period they had apparently reached the shores of the North Channel, where they had a slight influence on the stone industries of the strand-loopers, the Early Larnian in Kintyre, and the Late Larnian in north-east Ireland (Chapter V).

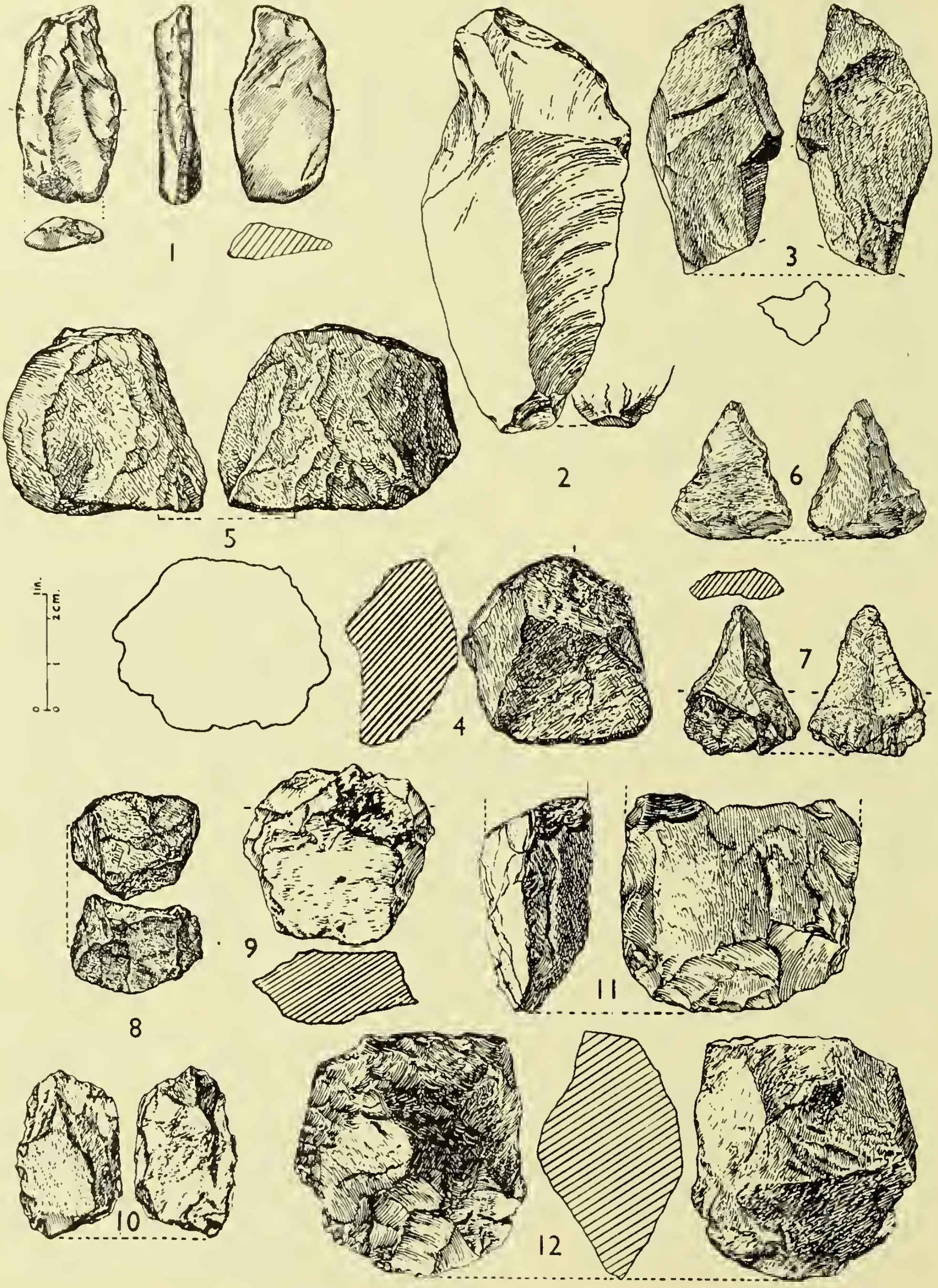

Fig. 76. Representative artifacts of stone industries in Luss parish, Loch Lomondside, Dunbartonshire. Nos. 1 (Balmaha jasper), 3–5, 7–9 (quartz), Inchlonaig; nos. 2 (Inverbeg lamprophyre), 6, 10–12 (quartz), Shemore, Glenfinlas.

A westward extension of the movement registered by the antler tools from the carse-clays around Stirling is suggested by several stone implements made in Baltic fashion from Loch Lomondside.[1] Those from Glenfinlas in Luss parish, Dunbartonshire, which include short, heavy quartz *tranchets* (Fig. 76, nos. 11 and 12), are surface-finds and therefore not strictly datable. Some, however, may go back to a late phase of Atlantic climatic time. Even if not contemporary, they (no. 2 of the local lamprophyre and the quartz implements nos. 6 and 10) are probably to be linked culturally with the products of another mixed stone industry which may now be mentioned from Inchlonaig in the same parish. Yielding mainly quartz tools (e.g. nos. 3–5, 7–9), this industry seems also to have turned out tools in the fine jasper of the quality found at Balmaha on the mainland, three miles to the south-east. An example (no. 1) was picked up on the north-east shore of this island quite near a settlement-site. In facies this thick blade exactly matches Late Larnian specimens from the shores of the North Channel, and its rolled condition serves to emphasize this likeness.

These sites may have lain on one of the routes from the North Sea drainage, by way of the greater glens and straths, to the western seaboard. Here, as will be shown in the next chapter, Baltic bone-working traditions are expressed in hybrid coastal industries developed on all the Mesolithic facies which had reached Scotland during the Atlantic climatic phase.

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[1] Lacaille, 1940(*a*), pp. 6–8; 1940(*b*), pp. 318–28.

VII

THE OBANIAN CULTURE OF ARGYLL

1. INTRODUCTION

DESPITE the expansion of the sea during the Atlantic climatic phase, some traffic between the mainland of Britain and Northern Ireland is suggested by Late Larnian flint tools of Baltic type from the Ulster seaboard. It is also possible that the contemporary Mesolithic industries on the coasts of the Firths of Solway and Clyde received influences from north-east Ireland. Nevertheless, there were cultural divergences in the two regions of the Mesolithic province west of the Highland Zone of Britain.

Whereas Larnian developments in Ireland are obscure, some light has been thrown on the equivalent growths on the western seaboard of Scotland. On the one hand, micro-burins and blade-implements, characteristically blunted, from the deposits of the Early Post-Glacial raised beach in south-west Scotland, prove the assimilation of Tardenoisian technical methods in coastal Mesolithic industries. On the other, it seems that the Late Larnian food-collectors on the Irish side of the North Channel did not acquire these methods. Indeed, no typically faceted artifact or micro-burin has so far been found in Ireland in the many comprehensive Larnian and Post-Mesolithic groups which include steeply dressed narrow blade-implements.[1] The Irish microlithic forms always appear to be made in the Upper Palaeolithic manner in complete flakes and blades, and never in pieces divided by the specialized micro-burin technique.

Though the quantities of derived Larnian materials tell us little of cultural developments in Late Atlantic times in north-east Ireland,[2] yet a recently excavated site near Dundalk, directly related to the Early Post-Glacial raised beach, has yielded unaltered flint artifacts which leave little room for doubt.[3] It seems that at this site a very late Larnian industry has been discovered far from the region where the strand-loopers' culture is believed to have been cradled. This culture spread far in the opposite direction, as is shown by the flint artifacts from the deposits of the Early

[1] Lacaille, 1942, p. 108, footnote; Batty, 1938.

[2] Movius, 1942, p. 180.

[3] Mitchell, 1947.

Post-Glacial raised beach at several places in the Firth of Clyde drainage (above, pp. 154–60).

2. COASTWISE NORTHWARD MIGRATIONS FROM THE SOUTH-WEST

(A) BUTE AND CUMBRAE

Settlements contemporary with an advanced Late Larnian phase in Ireland may have been represented by a shell-mound which stood formerly on the Early Post-Glacial raised beach near Ballantrae harbour, Ayrshire,[1] and by a kitchen-midden which lay under the Craigenew cairn-burial 150 to 200 yards from the sea at Glecknabrae, on the west coast of Bute.[2] Caves on this island opening on the Early Post-Glacial raised beach have yielded an abundance of occupation-refuse, but none proves that Bute was inhabited by man in a stage of Mesolithic cultural development. In the museum at Rothesay, however, there are a few patinated flint flakes and blades which are said to have come from this beach. These may indicate an extension of the Larnian in Bute. The excavation of a cave at Freeland, Millport, Great Cumbrae, which opens on the Early Post-Glacial raised beach, revealed successive levels of refuse interrupted by strata of sterile earth. This order is a mark of seasonal habitation. Quantities of molluscan shells were found here with the bones of animals and fishes, together with two well-made bone needles and lignite artifacts which are possibly ornaments.[3] Since these were found in the deep level, it is tempting to think that the cave first became the resort of food-collectors soon after the recovery of the land had begun. The Russell (or Waterloo) Cave at the south-west end of Little Cumbrae, though only partially excavated, has furnished comparable thick beds of food-refuse, but no positive implements.[4] Further work, if carried deeper, may disclose Mesolithic traces.

(B) DUNTROON, CRINAN

A stage in northward migration by way of the indented coast may be inferred from the report on a site at Duntroon on Loch Crinan, Argyll. This migration probably occurred not long after the recovery of the land had set in late during the Atlantic climatic phase, but while the sea could still carry gravel far inland.[5] At this site a small cave or shelter was exposed in the cliff behind a field which now occupies an extinct bay of the Early Post-Glacial sea. The floor was ascertained to stand about 30 feet above O.D., or 25 feet above, and just over 60 yards from, high-water mark. Drains cut between the rock and the sea, also farther inland, had driven through soil and peat topping the gravel of the ancient beach, which in turn overlay white clay (silt ?) similar to that under the sand between modern high- and low-water mark. Throughout this area charcoal with burnt flint chips were found in the shingle standing at approximately the same level as the cave-floor. From this about 2 feet of shingle was removed, and there were revealed a fire-damaged hearth-stone embedded in ash and charcoal, the bones of red deer and sea-birds, and lime-cemented masses of molluscan shells. Two flint scrapers and a nodule were recovered from this refuse. Contemporary sojourns on the beach and in the cave are indicated by these re-

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[1] J. Smith, 1895, pp. 222–3; Lacaille, 1945, p. 87.

[2] Bryce, 1904, pp. 42–44.

[3] Marshall, 1938, pp. 116–17.

[4] Ibid., pp. 117–18.

[5] Mapleton, 1873, pp. 306–8.

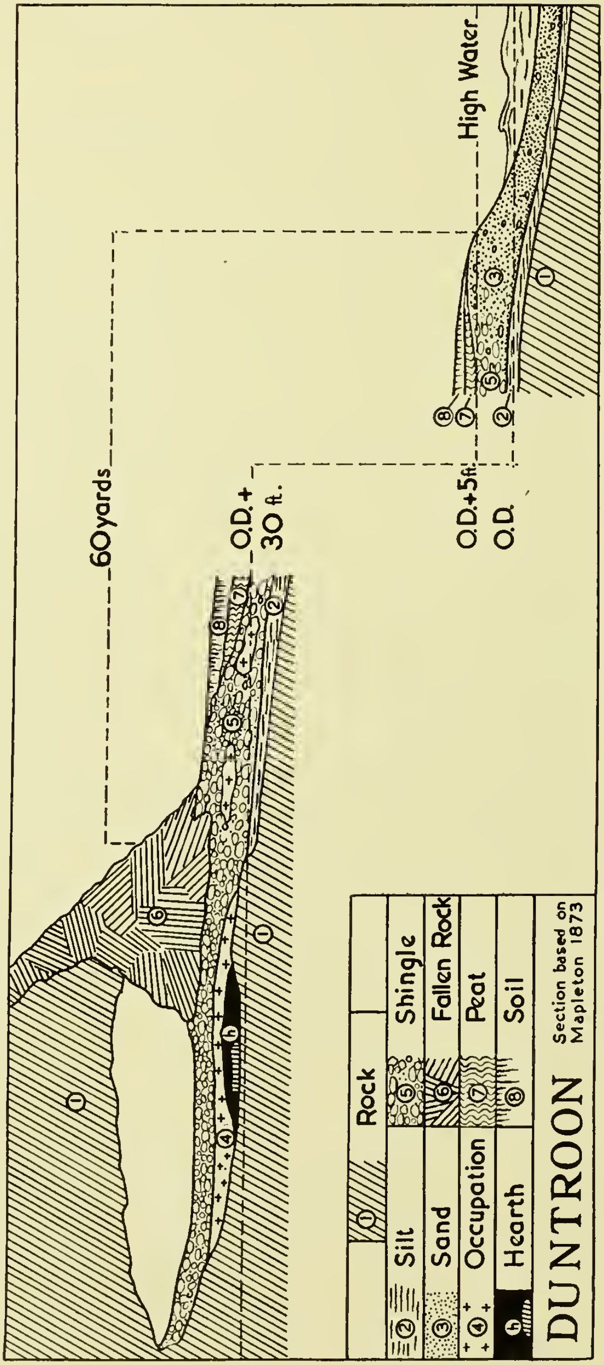
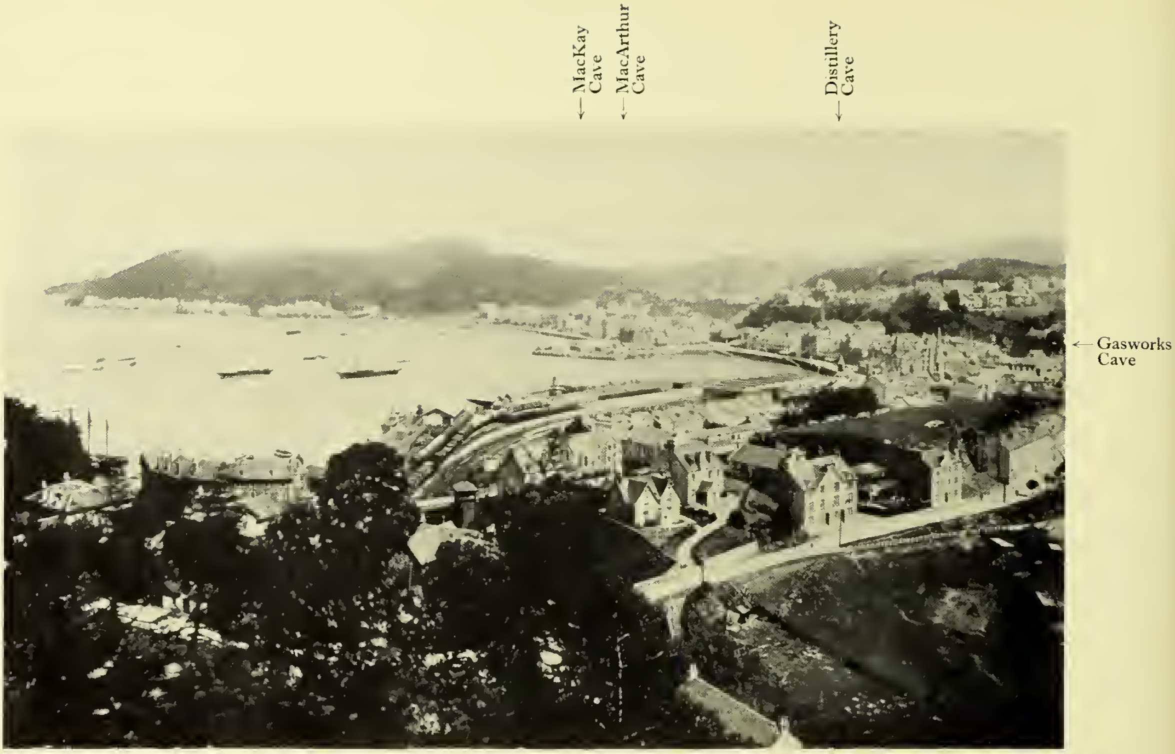


FIG. 77. The relationship between deposits in the Duntroon Cave and the Early Post-Glacial raised beach.

PLATE VII



(*a*) OBAN BAY, ARGYLL
(*By permission of Messrs. Valentine, Dundee.*)

(*b*) VIEW, FROM EAST BY SOUTH, OF CNOC SLIGEACH, ISLE OF ORONSAY, ARGYLL
(*After Bishop, 1914.*)

mains of occupation and industry. Fig. 77, based upon the published report, shows the relationship between the beach formation and the basal deposits in the cave. In different parts of this were found the skeletal vestiges of nine human beings, killed apparently by a fall of rock and stone which closed the shelter.

3. THE OBANIAN CULTURE

(A) DISTRIBUTION AND MODE OF OCCURRENCE

However scanty, these finds from coastal sites are links between the Larnian province of the North Channel shores and the centre of a culture which grew on the western seaboard of Scotland in Late Atlantic times. In the industries of this native culture Larnian traditions of stone-working and typology played an important part. Relics of this facies were first discovered between 1879 and 1882 on Oronsay, a small island lying ten miles west of Jura.[1] Owing, however, to the stratigraphy exposed by careful work and to the detailed studies of the remains of man's occupation in MacArthur's Cave at Oban, this mainland station, though brought to light later, has come to be regarded as the type-site of the culture. For this the name *Obanian* has been proposed,[2] and it is adopted here.

The Obanian culture is known only from sites in Argyll, caves and rock-shelters round Oban on the mainland (Pl. VII *a*), open-air camps on Oronsay, and on a rocky islet, Risga, in the narrows of Loch Sunart between Ardnamurchan and Morven. All these stations are associated with the raised beach or some other feature related to the transgression of the Early Post-Glacial sea. In every case the products of active industries have been recovered from occupation-refuse rich in animal remains. Examination of this refuse has established the fact that the fauna at all the sites was similar and entirely of recent character. From the zoological standpoint, however, it is unfortunate that unequal attention has been paid to the midden materials. A list of the animal forms identified is given in a later section (Table V).

The situation and composition of the deposits from these widely separated places indicate that the Obanian culture lasted a long time. Until quite recently, however, the remains and their age have been the object of some speculation. The reason for this is that much attention has been paid to the remarkable bone-work, while the flaked stone elements have been neglected and even dispersed. These stone elements have been scarce at all sites except Risga, but the whole assemblage from this station has been preserved, and the full Obanian culture can therefore be fairly assessed in the light of present knowledge. The identification of the faunal vestiges and the accurate accounts which have been given of most of the explorations have provided considerable insight into the economy of the Obanians.

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[1] S. Grieve, 1885.

[2] Movius, 1940(*a*), p. 76.

(B) TYPOLOGY

The tool-kit of the Obanian folk was of the simplest kind. It consisted for the most part of untreated or elementarily dressed pieces of bone and antler, pebbles, and even shells. To large sets of the rudimentary yet characteristic objects can be added the products of well-developed bone-working and stone-flaking. In these series there appear the influences of all the cultural strains which reached Scotland during the Atlantic climatic phase. Typologically the Obanian equipment may be considered as falling in the following categories:

1. *Bone and antler.* (i) Finger-like end-worn slivers, probably used as scrapers, rubbers, and polishers in the treatment of skins. (ii) Chisel- and adze-like tools, probably for stripping large carcasses; barbed fish-spears; plain points, awls, and pins.

2. *Stone.* (i) Narrow pebbles, end-worn and resembling the bone and antler forms, some doubtless having been employed in the same way as the forms of bone and antler, others possibly used in the preparation of food and bait; limpet-hammers. (ii) Heavy pebble-implements brought to a sort of cutting-edge by grinding, rubbing, or rough flaking, many showing the signs of use in conjunction with a hammer and anvil, probably for cleaving bone, and possibly for woodworking; hammer-stones, anvils, and hones. (iii) The products of the knapper's technique, notably flake- and blade-implements, picks, choppers, and chisel-like forms.

4. MAINLAND SITES AT OBAN

(A) THE MACARTHUR CAVE

This cave was discovered towards the end of the year 1894 (Fig. 78) by quarrymen who were removing rock from the face of the cliff backing the Early Post-Glacial raised beach near St. Columba's Church. It was methodically excavated shortly afterwards.[1] Situated 100 yards from the present beach, and opening at 34 feet above O.D. on the Early Post-Glacial formation, the cave was found to measure roughly 25 feet in length and 16–20 feet in width (see plan, Fig. 79). Removal of the talus and fallen rocks which cumbered the entrance revealed a possibly artificial barrier of rocks, behind which the infilling reached almost to the roof. In clearing this the following section was noted (reading from below upwards):

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[1] Anderson, 1895.

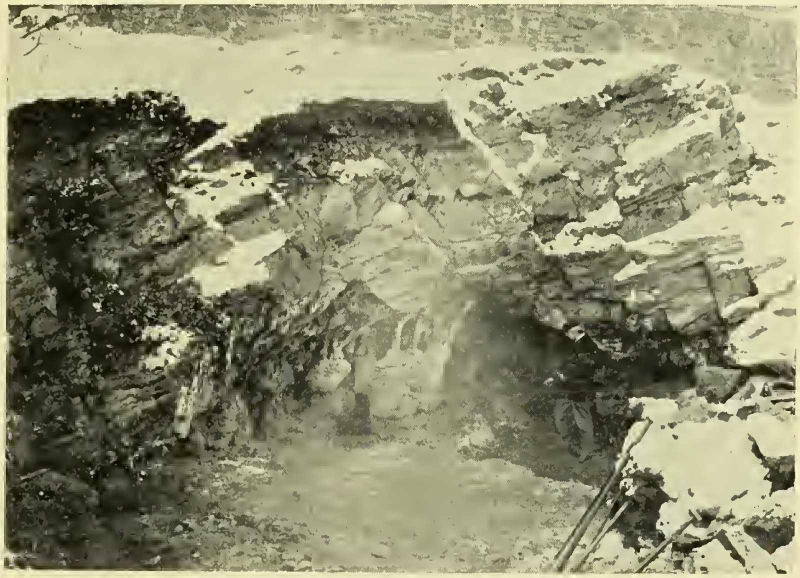

FIG. 78. The MacArthur Cave, Oban. (After Anderson, 1895.)

	Ft.	*In.*
3. Talus of stones and black earth	6	0
2. Concreted deposit of shells, many burnt, with patches of ashes mixed with charcoal and splinters of bone, many charred, varying in thickness from 2 ft. 3 in. to	3	0
1. (*c*) Fine clean beach gravel with small and large pieces of rock at the bottom, up to approximately	4	0
(*b*) Deposit of shells mixed with bones, about		6
(*a*) Fine clean beach gravel	1	6
	15	0

It is significant that the occupation-refuse occurred between the two lower beds of gravel on the floor of the cave, which now lies high above sea-level and distant from the present shore. This demonstrates that, although the re-elevation of the land had begun before the site was first inhabited by man, the Early Post-Glacial sea had not receded far, since, in storms at least, its waves could still carry shingle into the cave.

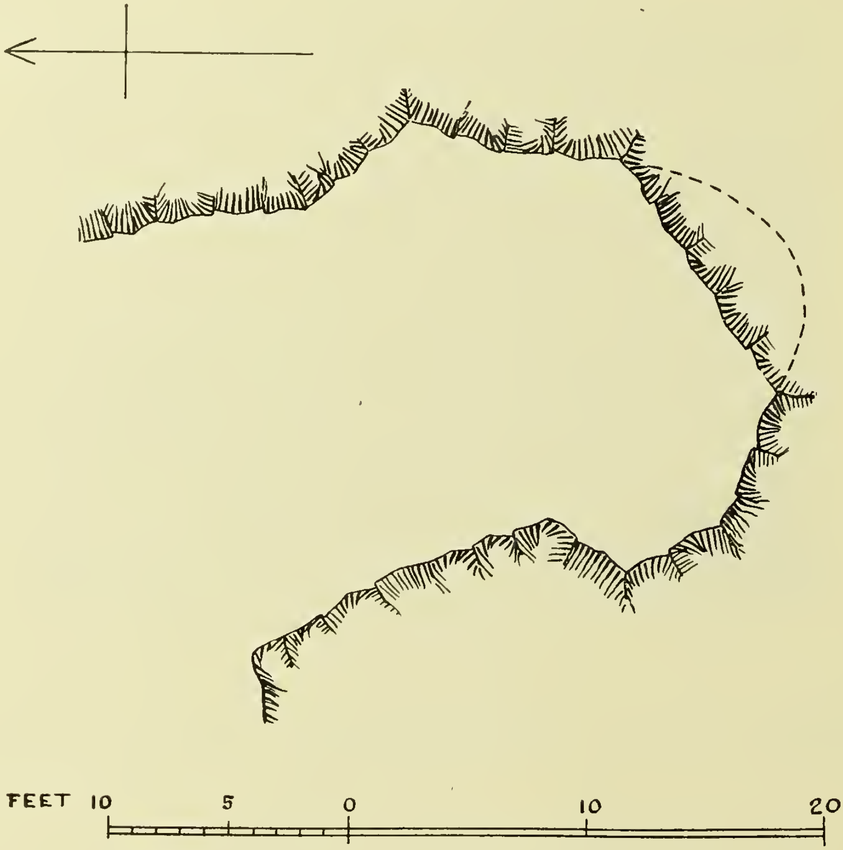

Fig. 79. Plan of the MacArthur Cave, Oban. (After Anderson, 1895.)

The two layers of refuse were found to be composed of the shells of edible molluscs, and the bones of fish, sea-fowl, marine and land mammals, all evidently the remains of the cave-dwellers' food. In places the midden materials and gravel had been cemented together by the calcareous drippings from the roof (Fig. 80).

Most of the bones were broken, the larger apparently for the extraction of the marrow and for the manufacture of implements. Of these 153 examples were recovered, together with over a score of flints and other stones.

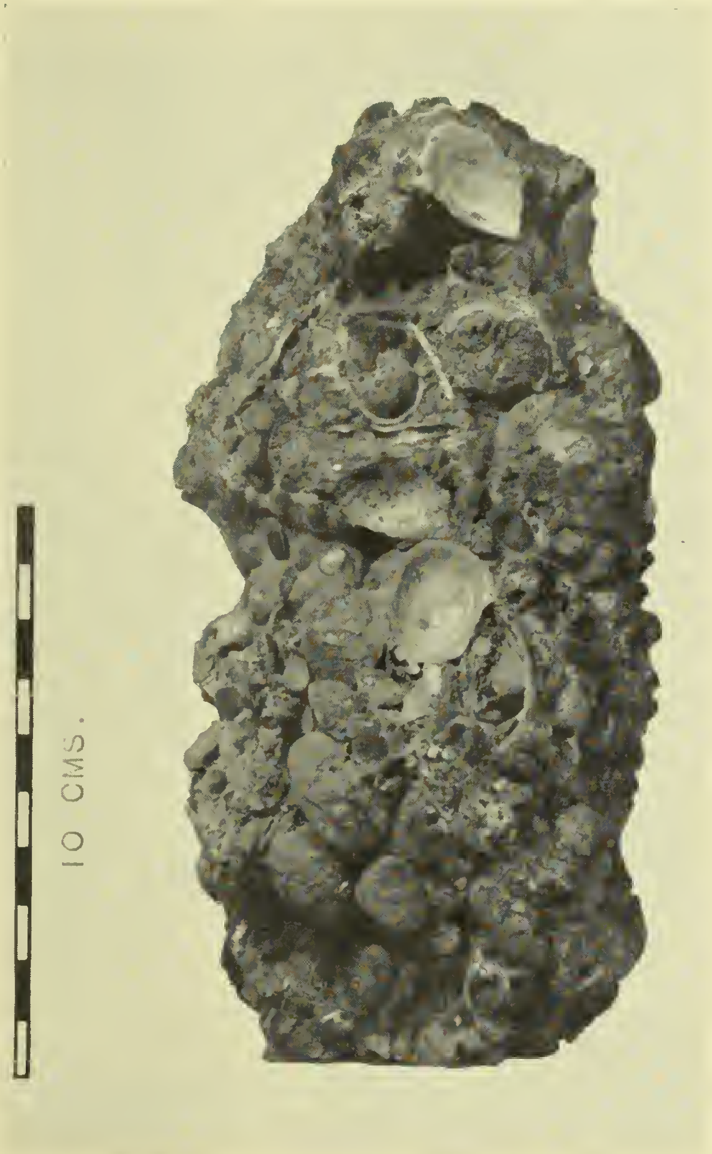

FIG. 80. Concreted occupation-refuse and shingle from the MacArthur Cave, Oban. (In the Wellcome Historical Medical Museum.)

The fauna represented is tabulated with that recorded from other Obanian sites (Table V).

The black earth overlying the upper bed of Obanian refuse contained quantities of bones of small birds, bats, rodents, a dog, and a few of the larger ruminants. In the lower part of this black earth a man's skull was found, and on its surface there was a second skull, with other human bones scattered around. It was decided that at least four individuals had been buried in the cave. But the reports on the conditions in which their remains were recovered do not indicate methodical burials or an Obanian association.

Examination of the archaeological material, which was acquired by the National Museum of Antiquities, Edinburgh, and of which a representative series is illustrated (Fig. 81), shows its identity with that discovered on Oronsay more than ten years before.

Bone implements. By far the most numerous of the relics are finger-like objects of bone and antler. One hundred and forty of these were found and examples are shown (nos. 1–4). They are splinters, each of which shows an end rubbed to a more or less rounded and blunt edge. Since in some the worn area is as smooth as ivory, and in others striated as if used with an abrasive, it is thought that these simple pieces probably served as rubbers or scrapers in the preparation of skins. Some specimens are worn at both ends (e.g. no. 4); and two are remarkable as being made out of the leg-bones of red deer, with the condylar process preserved in each case as a grip or handle (nos. 5 and 6).

Pins, two fragmentary, one whole (no. 7), and three awls or borers with finely-drawn points and expanded butt-ends (e.g. no. 8) are included, together with three bird bones simply flattened on one side. The most distinctive artifacts from the MacArthur Cave are seven flat barbed points made in antler. Only two are entire (nos. 9 and 10). Both have four barbs on each side and a midrib extending from the tip to the rounded-off butt. In the larger (no. 10) this is perforated in the manner of a harpoon, undoubtedly for the attachment of a line. Enough remains of the fragmentary examples to show that when complete they were similar in character to the undamaged survivors. One, consisting of a tip and two alternately disposed barbs, appears to have been restored for service as a shortened armature by rubbing down the break to form a butt (no. 11). In general, these fish-spears agree well with Azilian forms from the Pyrenean region, though the Scottish

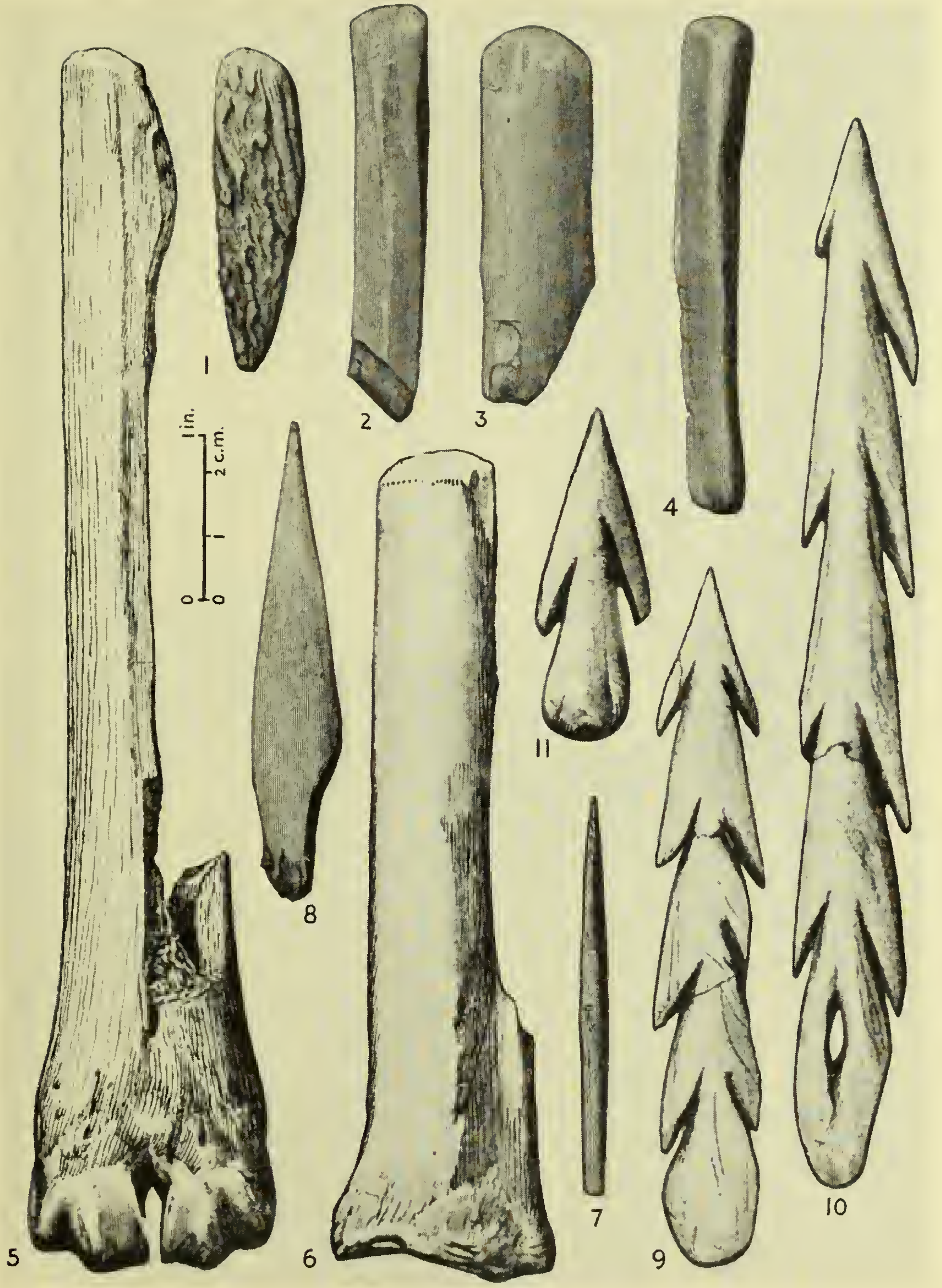

FIG. 81. Obanian bone and antler implements from the MacArthur Cave, Oban. (After Anderson, 1895.)

examples are not flat but convex in the body. It is this resemblance that has led to the assumption that Azilian strains reached the west of Scotland.

Stone implements. Stone tools from the MacArthur Cave are extraordinarily poorly represented. Of the twenty unpatinated flints recorded, only eight are definable. These are two primarily flaked cores, two broken flakes, one apparently retouched as an end-scraper, and two flakes, one showing wear as if from use as a side-scraper or knife. Three small water-worn pebbles, bearing the characteristic abrasions of hammer-stones, complete the list. One, pitted in two places on one side, seems to have served as an anvil also. A few pebbles from the site, normally longer and broader than this pitted specimen, and bearing fainter signs of use, belong to a particular order of Obanian improvised tools. These are regarded as limpet-hammers, and are more abundantly represented in the collections from Oronsay which will be discussed later.

(B) THE DRUIMVARGIE ROCK-SHELTER

This is a cavity, 15 feet wide, weather-worn to a depth of 8 to 10 feet in brecciated slaty rock. It was excavated in 1896 following its exposure by the clearing of talus at the base of a ridge running north-east to south-west behind the town of Oban.[1] The mouth, 48 feet above O.D., faces east, or landward, over the marsh Loch-a-Mhuilinn, which would be a quiet shallow bay during the transgression of the Early Post-Glacial sea.

The occupation-refuse, undisturbed by waves, proved to be 4 feet thick, and with the overlying protective talus reached almost to the roof. Spreading from the mouth to the back of the opening, it was found to contain shells, claws of crab, and mammalian bones, besides patches of hearth ashes.

The archaeological material (Fig. 82), now housed in the National Museum of Antiquities, Edinburgh, is similar to that from the MacArthur Cave. It consists mainly of the characteristic round-nosed tools. Of five larger-sized specimens, four are made from the split leg-bones of red deer and one from antler. One (no. 1) narrows somewhat towards the working end; another is scarred as if from use as a punch (no. 2). There occurs a comparable example formed from a wild boar's tusk (no. 7) among thirteen smaller, and, as it were, standard-sized tools of this category (nos. 3–8). Two pieces of bone, ground at one end to a sharp point, may be regarded as awls or borers (nos. 9–10). But the most remarkable objects are two

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[1] Anderson, 1898, pp. 298–306.

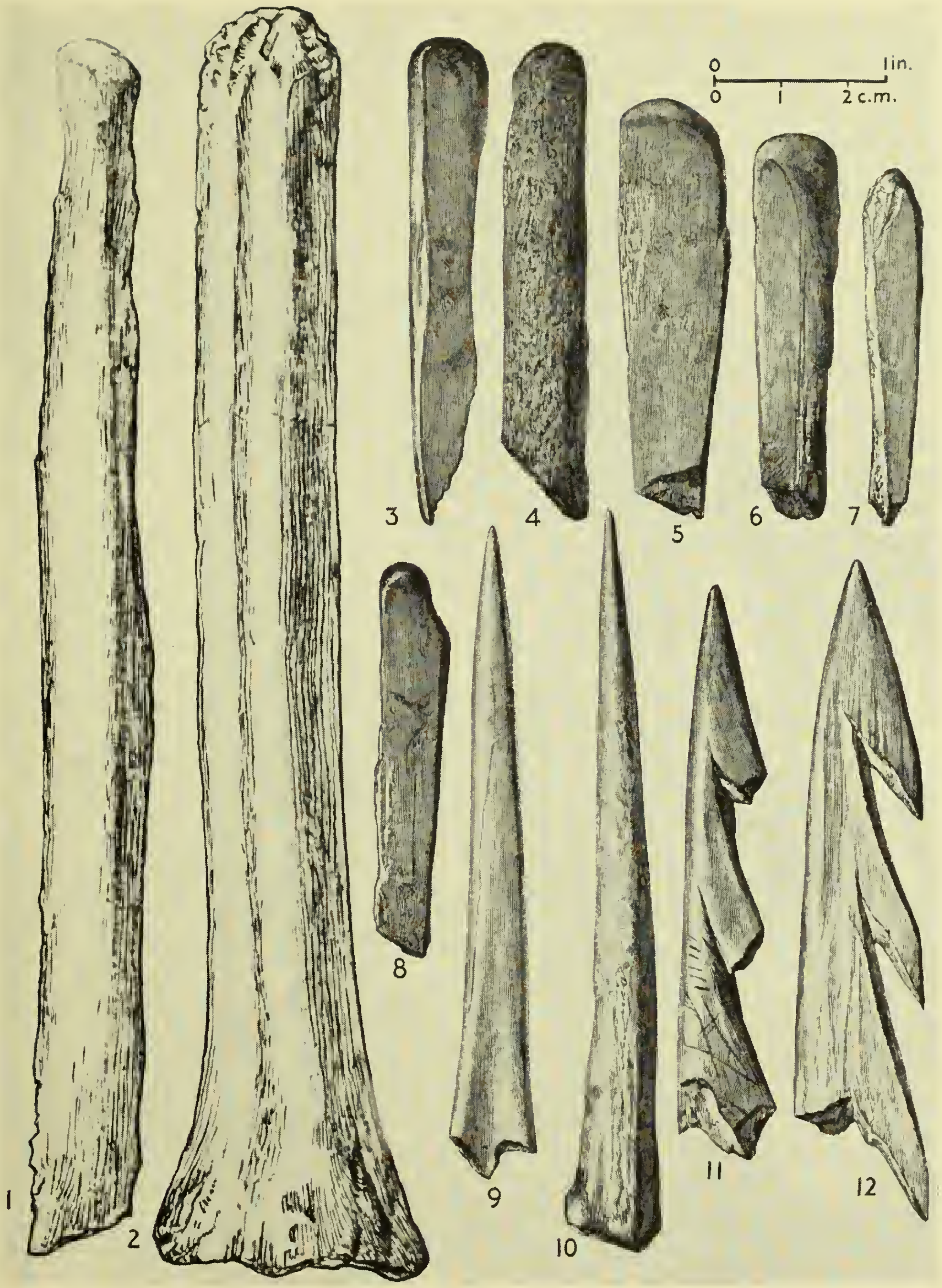

FIG. 82. Obanian bone and antler implements from Druimvargie Rock-shelter, Oban. (After Anderson, 1895.)

broken bone points with barbs deeply cut along one side only (nos. 11–12). This style of barbing differs entirely from that of the forms from the MacArthur Cave. It finds its nearest prehistoric parallel in certain Maglemosean bone points from the Baltic area,[1] and is exactly matched by recent Eskimo fishing-gear.

A piece of red deer antler from this site shows in the broken section part of a circular perforation, probably for hafting the implement when whole. It is thought that this object, like similar relics from other Obanian stations, would be an adze-like tool of the nature of a blubber-mattock, resembling the Baltic forms reported from the estuarine clays of the Forth near Stirling (pp. 171–4). Considered even by itself it would, of course, be interesting as a tool-type, but, taken with other Obanian artifacts which suggest influences from the North Sea basin, it becomes significant.

Four elongated water-worn pebbles, 10 to 15 cm. in length, are so abraded at one end to a bevelled blunt chisel-edge that they may be regarded as belonging to the same category as the characteristic bone and antler implements. The end of one of these stone implements is pointed and flaked away backwards, as if injured from violent use. This specimen appears to rank with the utilized pebbles from the MacArthur Cave and Oronsay, which several competent workers have regarded as limpet-hammers.

One ill-defined flint flake-implement with slight traces of secondary working is recorded from the Druimvargie Rock-shelter.

(C) OTHER CAVES ON OBAN BAY

Whilst building operations were in progress in the second half of the nineteenth century, four other caves were discovered in the rock backing the Early Post-Glacial raised beach in Oban Bay. Three contained traces of prehistoric man in the form of his skeletal remains, food-refuse, bone and stone implements, and, in one instance, fragments of coarse pottery.

1. THE DISTILLERY CAVE. Owing to various accidents the stratigraphy and character of the deposits could not be determined.[2] Despite this, it seems that an Obanian layer was broached in the Distillery Cave, opening about 40 feet above present sea-level and facing north-north-west. Besides 'many cartloads of shells' which this cave is said to have yielded, there were recovered the bones of fishes, birds, and mammals, and also human bones of four adults and four children. A long, narrow and thin spatulate tool of

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[1] Clark, 1936 (*a*), pp. 116–17, and Fig. 41, no. 10.

[2] Turner, 1895, pp. 418–23.

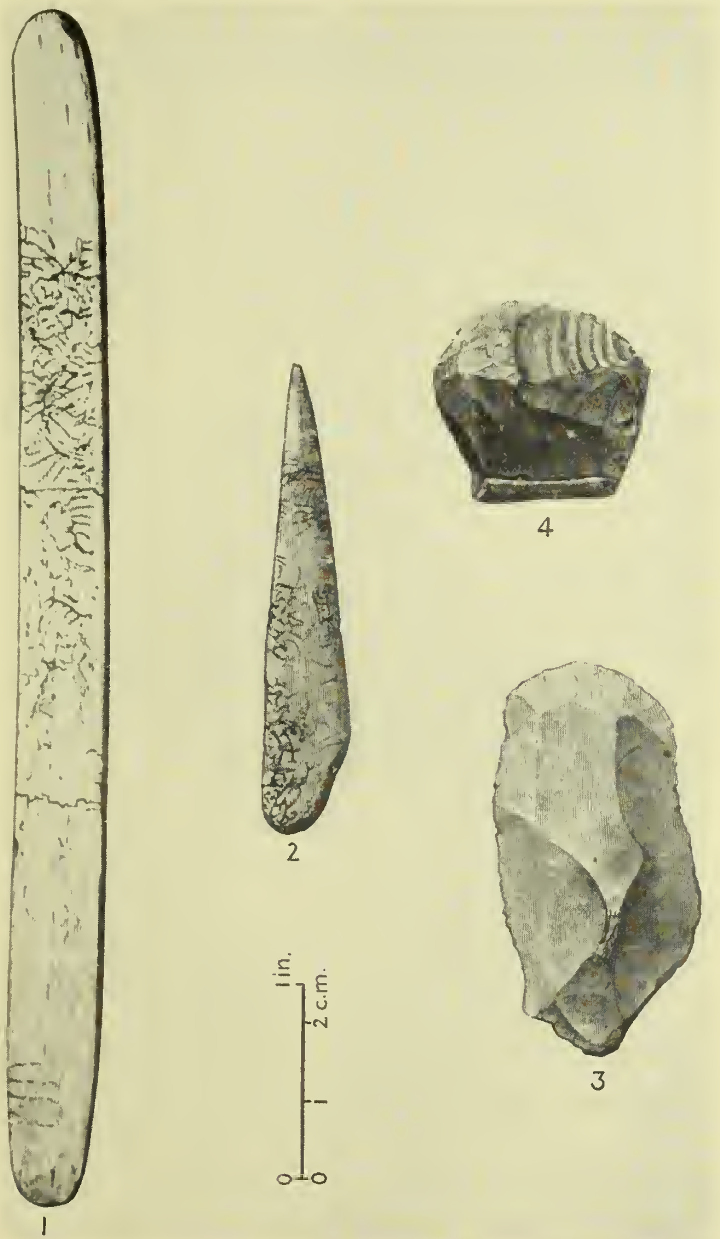

FIG. 83. Obanian implements of bone and flint from Oban. Nos. 1 and 2, Distillery Cave; nos. 3 and 4, Mackay Cave. (After Turner, 1895.)

deer-horn, rounded and worn at the ends, and a borer of bone were retrieved (Fig. 83, nos. 1 and 2), as well as five flint artifacts which showed no signs of retouching. Since the cave had been cleared before a proper survey could be made, it was not possible to ascertain the true place of the human remains in the deposit.

The bones from the Distillery Cave are identical with those found in other caves, and have been recognized as individuals who could be classed with the men of the English long barrows. The adults at least agreed in respect of their dolichocephalic skulls, their moderately low stature, and platycnemic tibiae.[1]

2. THE MACKAY CAVE.[2] This cave at Oban was the first to be discovered and lies farthest north. The earth in it provided evidence of the Mesolithic mode of life, possibly Obanian, of the inhabitants. The opening was revealed about 20 feet up in the rock, facing south. It is interesting to note that dog bones were found with the much-broken skeletons of a man and a child, limpet-shells, the bones of birds and animals, many split and some calcined, fragments of granite and water-worn pebbles, and sixteen flint artifacts. The flints, which are now in the National Museum of Antiquities at Edinburgh, exemplify the best flintwork from the Oban caves. They include edge-worn flakes, an end-scraper on a fine blade and a side-scraper, both well retouched and resembling Larnian rather than any later forms (Fig. 83, nos. 3 and 4).

3. THE GAS-WORKS CAVE. From the floor of a cave exposed in the rock behind the gas-works quantities of shells were removed long before an examination could be made.[3] Such samples as had been saved were found to contain the remains of the commonest molluscs, and of pig, goat, red deer, and ox. Human bones were collected, but they were too fragmentary to throw light on the type of the skeleton. A flint chip and small pieces of pottery were picked up. Unless the contrary can be proved, the pottery, if associated with the food-refuse, would point to an occupation later than true Obanian.

(D) DUNOLLIE

The sojourn or home of a family detached from the principal communities is suggested by remains from a rock-shelter which was found near

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[1] Turner, 1895, p. 436.

[2] Ibid., pp. 410–17.

[3] Ibid., p. 417.

Dunollie Castle, a mile north of Oban Bay. It was under the overhanging cliff cleared in 1906, about 200 yards from, and opening about 20 feet above, present high-water mark. Below soil, which contained the bones of a young child and the scraps of recent tenancy, there occurred the refuse of prehistoric occupation in the form of layers of ashes and quantities of shells, of which limpet and periwinkle were the commonest. A well-made bone needle and some unretouched flint chips were picked out from this midden. The needle is now preserved in the National Museum of Antiquities at Edinburgh.[1]

5. ISLAND SITES

(A) ORONSAY

Oronsay is attached at low tide by an intervening strand to the larger island of Colonsay. The attention of visitors to Colonsay and Oronsay had long been attracted by several conical mounds, lying in the southern parts of these islands, on sand-dunes or rocky knolls within a few hundred yards of the sea. To past inhabitants they were known by the generic name *sithean*, 'of the fairies' or 'of the magicians'.[2] Three have been explored on the east side of Oronsay. It was the work upon the first, Caisteal-nan-Gillean, which revealed between 1879 and 1882 an imposing assemblage of relics belonging to a culture previously unknown in Scotland.[3] These, and remains from a second site, Cnoc (Croch) Sligeach, which was excavated in a limited area in 1884,[4] and those also from a third, Cnoc (Croch) Riach[5] examined about the same time, were eventually correlated with series from occupation-refuse in caves on the mainland at Oban, forty miles to the north-east. An extensive digging carried out in 1913 on Cnoc Sligeach showed the composition of the mound, and yielded many animal remains and much interesting supplementary archaeological material.

1. CAISTEAL-NAN-GILLEAN. Standing isolated between a range of sand-dunes and the sea on the south-eastern shore of Oronsay, the turf-covered and approximately circular mound Caisteal-nan-Gillean ('The Fort or Castle of the Young Men, Servants or Followers') was found to be 150 feet in diameter at the base and about 25 feet high in the centre (Fig. 84). Excavation revealed that it was a sand-hill topping an old land-surface, which rested upon angular stones weathered off the underlying rock. The

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[1] MacDougall, 1907.

[2] S. Grieve, 1923, i, p. 45.

[3] Idem, 1885, chap. vii.

[4] Anderson, 1898, pp. 311–12.

[5] Ibid., pp. 312–13.

drawing of the cross-section which accompanies the original report is reproduced here (Fig. 85). It shows the hill as composed of pure wind-blown sand with some intercalated shingle and occupation-refuse down to about 8 feet in its central and inner portion.

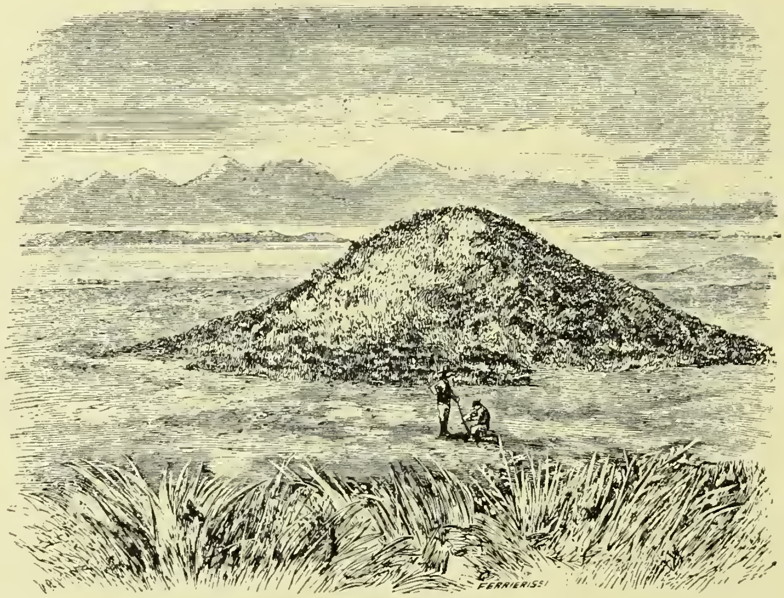

FIG. 84. Caisteal-nan-Gillean, Oronsay. (After S. Grieve, 1882, from a photograph by W. Galloway.)

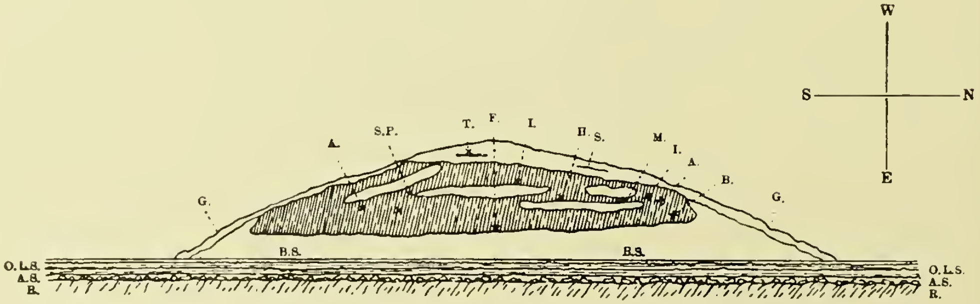

FIG. 85. Section through Caisteal-nan-Gillean, Oronsay. (After S. Grieve, 1923.) R, rock; AS, angular stones weathered off rock; OLS, traces of vegetation, old land-surface; G, grass turf; A, bones of great auk; SP, barbed bone points; T, old turf; F, broken flints; I, stone and bone implements; H, hearths and flat stones; M, fish remains; L, limpet-hammers and other implements of stone and bone; B, egg debris; BS, blown sand; S, sand.

The midden contained quantities of shells of the usual edible molluscs of the sea-shore, remains of crabs, the bones of fish, birds, and mammals (Table V). Hearths with patches of ashes and charcoal and pockets of stones reddened and cracked by fire were found. Close by, there lay masses of semi-congealed, gelatinous and scaly matter, which was thought to consist of cooked fish-skins. Most of the implements recovered now form part of the national collections in Edinburgh. They include the round-nosed, chisel-ended, blunt-edged forms of the kind which were so common in the Oban caves. Ninety-three are formed of splinters of bone and fifty-seven of pieces of antler.

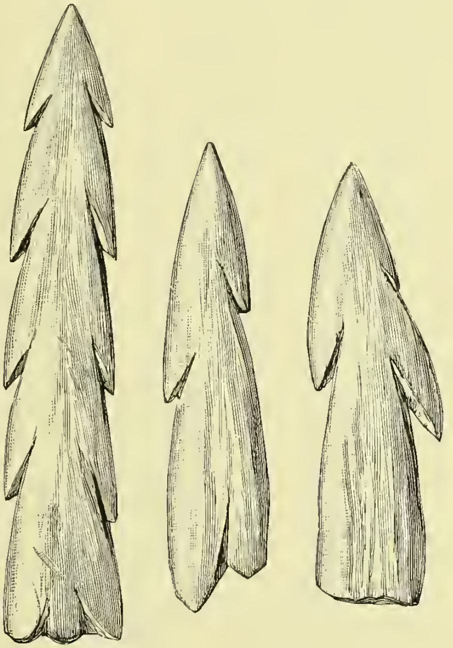

FIG. 86. Obanian barbed points of bone from Caisteal-nan-Gillean, Oronsay. ($\frac{1}{1}$) (After Anderson, 1898.)

Bone. Several well-made bone implements come from Caisteal-nan-Gillean. These include pins and awls. The butt-end of one awl is rounded and abraded like the common Obanian finger-like rubbers of bone, antler, and stone.

Ten barbed bone fish-spears and the butt of another were found. Though all have been missing since they were displayed at the International

Fisheries Exhibition in 1883, by a fortunate chance they were sketched at the time. The drawings of three are reproduced in Fig. 86. These show that, although each specimen is barbed differently, the pieces of fishing-gear were akin to those from the Oban caves. But in spite of this broad resemblance, neither the symmetrically nor the irregularly barbed tip-fragment is as definitive as the mainland examples, such as those from the Druimvargie Rock-shelter, which suggest Continental Mesolithic traditions in the Obanian bone-work. This observation applies also to the complete specimen, which in facies is as generalized as are most post-Mesolithic points.

Eight pieces of red deer antler, still showing sections of circular perforations, are included in the assemblage from Caisteal-nan-Gillean. Clearly they belong to the same order of implements as the perforated fragments of stag's horn from Druimvargie. Another artifact, imperforate and formed in a piece of split bone (Fig. 87, no. 4), seems referable also to this class rather than to the order of common narrow bevel-ended tools (such as nos. 2, 3, 6, and 7), since in form its rubbed-down adze-like edge presumedly links this example with Baltic types.

Scraper-like tools made in pieces of bone split longitudinally, plain as nos. 1 and 5, and rubbed down to a working-edge at one or both ends (e.g. nos. 5 and 8), deserve comment as showing further the comprehensiveness of the Obanian equipment recovered from Caisteal-nan-Gillean. In the specimens preserved both the faces presented by the division of the material have been tooled, the treatment has brought the convex face or outside to a pronounced bevel, and the concave or inside to the partial obliteration of the natural hollow.

Stone. Among the discoveries at Caisteal-nan-Gillean were many large flat stones, pitted as if from the impact of hard objects. These were most probably blocks which were used as anvils in conjunction with hand-tools for crushing, breaking, or cutting bones and wood, and possibly also for preparing shell-fish. Implements indicating such uses are well represented by utilized pebbles, which match components of the series from the MacArthur Cave and Druimvargie Rock-shelter at Oban.

Like their mainland counterparts, the relics from Caisteal-nan-Gillean which bear evidence of forcible use are bruised and flake-scarred at the ends and sides, besides being ground or worn at one or both ends to a blunt, convex, or straight edge. Some are so marked as to suggest that hammers

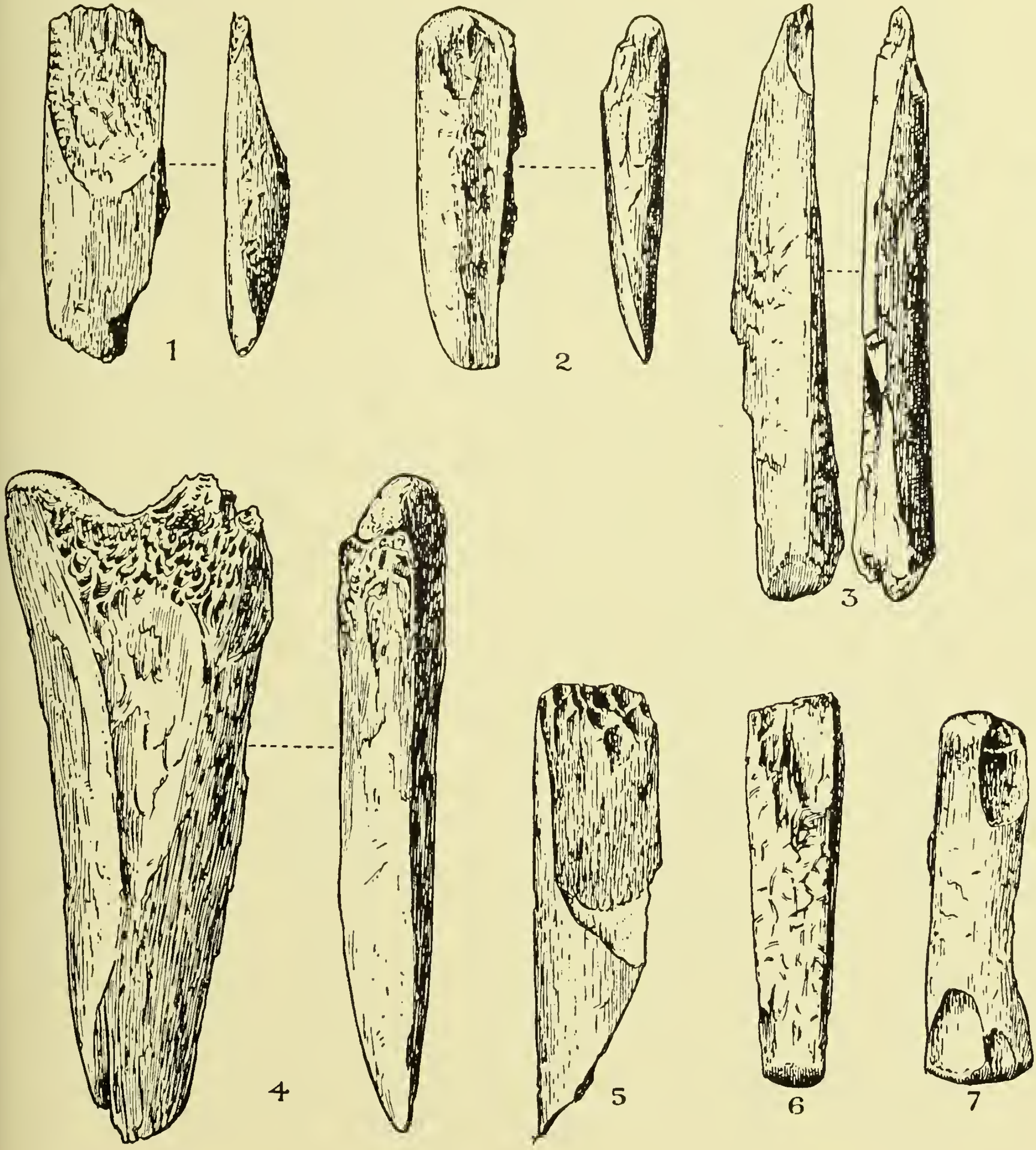

Fig. 87. Obanian implements of bone and red deer antler from Caisteal-nan-Gillean, Oronsay. ($\frac{1}{1}$) (From Movius, 1942, after Breuil, 1922.)

were used with these much-injured tools, which seem to fall into the same category as certain Late Larnian heavy flint forms.[1]

Again, the convenient length (18 to 20 cm.), shape, and edge of a few naturally split and rolled pebbles suggest that they could have been used for flensing.[2] Since flint was scarce and had to be carefully used on Oronsay and at Oban, it is not very remarkable that pebbles of convenient shape and size were freely employed with little or no working, or were treated by methods devised in response to local needs. Apart from rare beach-found drift-borne nodules, the nearest native sources of flint are beds under the basalt cliffs of Carsaig on the south shores of Mull,[3] in Morven, and in Ardnamurchan.

Implements which may also have been used in conjunction with large flat stones in the preparation of food and bait are well represented by pebbles, worn at one or both ends to a convex area or pestle-like round (e.g. Fig. 88, nos. 8 and 9). In most of the extremely numerous specimens of this series the wear consists mainly of a narrow, rough bevelling on one or both faces, occasionally accompanied by slight flaking backward from the used part (nos. 2, 4, 6, 8, and 9). These, like other Obanian rudimentary pebble-implements, have been the object of much conjecture. While it is, of course, admitted that many cannot be satisfactorily explained, yet there are good reasons why certain views expressed on their uses should be rejected. The claim[4] that these worn and scarred pebbles were instruments for preparing flint is nullified by a consideration of the dearth of tractable raw material, and the consequent scarcity of flaked stone implements in the middens of Oban and Oronsay. The suggestion that some served as axes, adzes, and chisels[5] (e.g. nos. 1–4 and 6) is much more likely, particularly when it is remembered that the Obanian industries represent developments comparable with the Late Larnian.[6]

In the light of these remarks we shall now consider these plain utilized pebbles (e.g. Fig. 88, nos. 5, 7, and 9). For these a simple and valid explanation is based on modern analogy. Moreover, it is upheld by similar objects from coastal sites, not only on the seaboard of the West Highlands and other parts of Scotland, but also from other countries where shell-refuse demonstrates that molluscs, and especially limpets, were the predominant

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[1] Movius, 1942, pp. 183, 185.

[2] S. Grieve, 1923, i, p. 55.

[3] Turner, 1871, p. 161.

[4] Breuil, 1922, pp. 267–9.

[5] Clark, 1932, p. 15.

[6] Movius, 1942, p. 183.

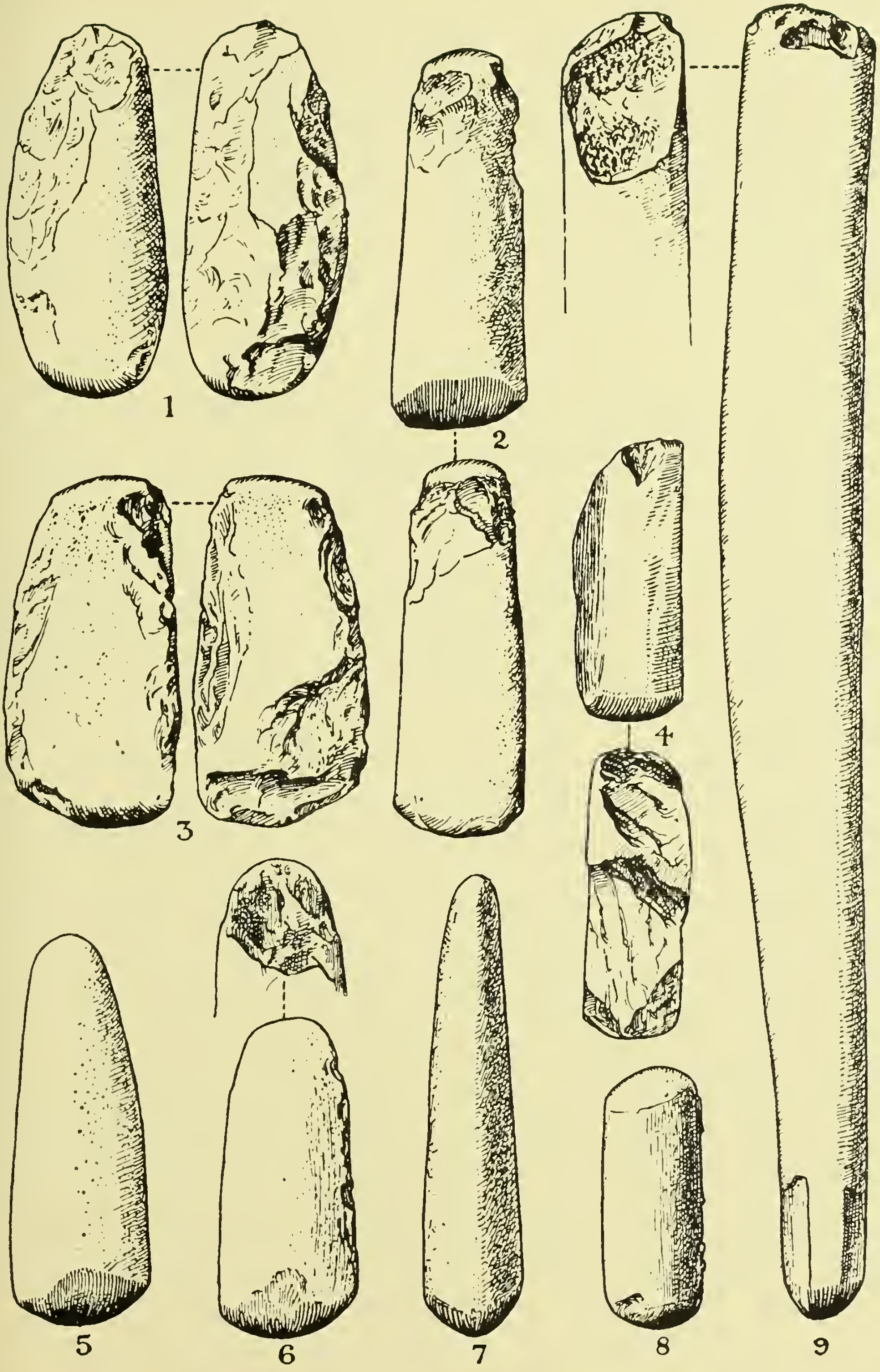

FIG. 88. Obanian stone implements from Caisteal-nan-Gillean, Oronsay. ($\frac{1}{1}$) (After Breuil, 1922.)

fare of poor societies. These stones were used by the Obanian folk just as modern fishermen in these parts employ similar pebbles to knock limpets off the rocks for bait.[1] Fig. 105 includes the illustration of a pebble (no. 3) which was used in this manner; it shows markings which are identical in type with those of the prehistoric implements. Further, tests with such stones produced in most cases holes and injuries exactly like those in countless limpet-shells in the occupation-refuse at Obanian stations.

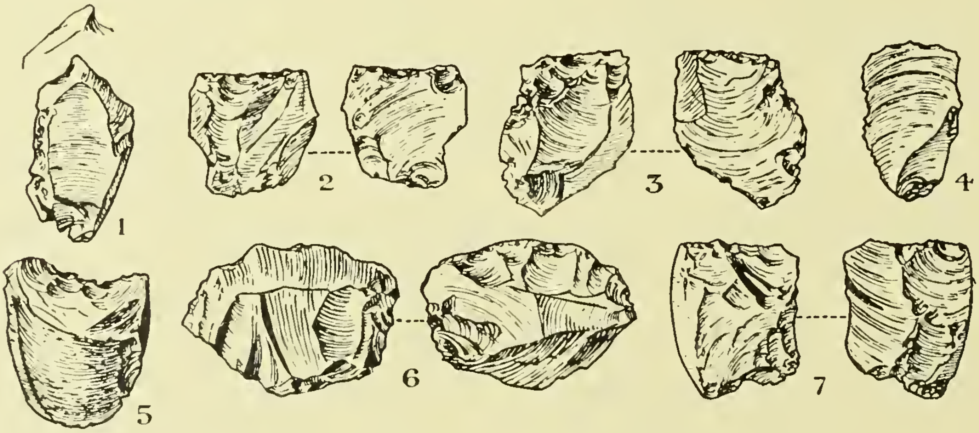

FIG. 89. Obanian flints from Caisteal-nan-Gillean, Oronsay. ($\frac{1}{1}$) (After Breuil, 1922.)

The fact that the collection from Caisteal-nan-Gillean includes relatively few flints (Fig. 89) points to the shortage of fissile stone on Oronsay. Seldom exceeding 2 cm. in length, the flints consist mostly of characterless flakes (no. 4 being an unscathed example). The splintered and scaled condition of so many (e.g. nos. 2, 3, 5, and 7) reflects the scarcity rather than the indifferent quality of the material. It indicates use to the utmost, as does a similar condition in their counterparts among several Larnian groups from the south-west. As in these Larnian series, there are present in this clutch from Oronsay flakes worn down from use as end-scrapers (nos. 2 and 3), a rudimentary concave end-scraper (no. 5), and a sort of side-scraper (no. 6). The affinities of this poor group with the more advanced Larnian industries of the south-west, which comprised Tardenoisian techniques and simple forms, is demonstrated by no. 1, a micro-burin.

2. CNOC SLIGEACH. Cnoc Sligeach (Gael. 'The Shelly Mound') has been described as a turf-covered sand-hill standing on rock 650 feet from

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[1] S. Grieve, 1885, p. 57.

the present shore-line, its top being about 54 feet above O.D. and its axes approximately 300 and 160 feet. It shows several occupation-sites (Pl. VII*b*).

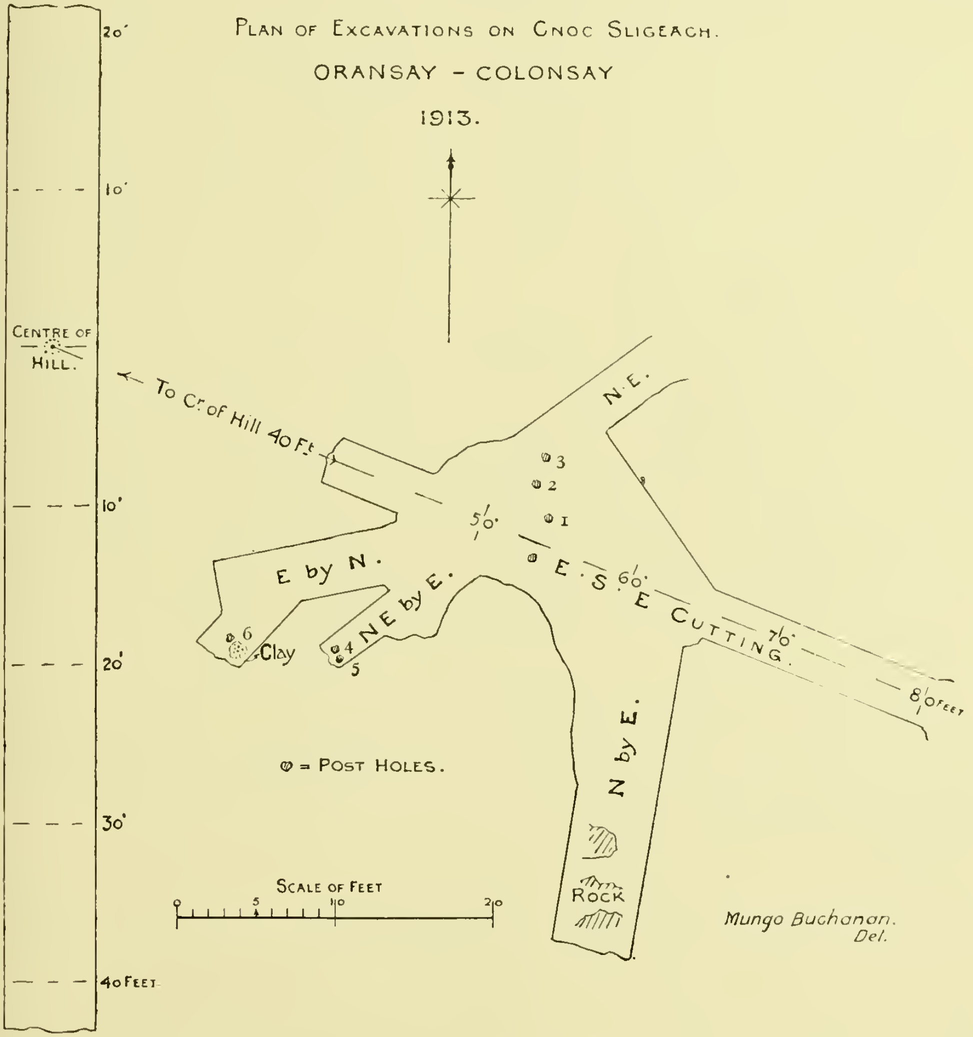

Fig. 90. Plan of excavations on Cnoc Sligeach, Oronsay, in 1913. (After Bishop, 1914.)

The excavation in 1884 broached such a site on the summit, while the extensive trenches dug in 1913, radiating from a centre about 40 feet from the crest, involved part of the eastern flank (Fig. 90).

1. No record appears to have been kept of the stratigraphy and animal

remains revealed by the first excavations of Cnoc Sligeach, but the detailed accounts of the later work[1] make ample compensation.

The archaeological material from the early exploration of a heap near the crest was taken over by the National Museum of Antiquities at Edinburgh, and can be enumerated. It is composed of relics precisely similar in simple elements to those from other Obanian stations.

Bone. There are thirty-six of the short, narrow, round-nosed splinters of bone and antler. Two only are worn at both ends. The well-rounded end of a wider piece is highly polished, flattened, and slightly bevelled on one face. This specimen therefore affords a parallel to the example from Caisteal-nan-Gillean (Fig. 87, no. 4).

Stone. About 150 oblong water-worn pebbles, end-abraded like the rudimentary implements of bone and antler, have been listed. The majority are short, all but a dozen being under 10 cm. in length and narrow in proportion. The wear exhibited by several, particularly the heaviest and longest, brings the affected specimens within the class of stones believed to be limpet-hammers. The irregularity and varying position of the holings in large numbers of limpet and other shells found here indicate how these implements were employed. Also in the collection are three indented hammer-stones and nine rounded anvil-stones pitted on the middle of their broader faces.

More flints were found during the course of the first excavation of Cnoc Sligeach than from Caisteal-nan-Gillean and the Oban caves. All that can be said of these ninety-odd pieces, however, is that they consist of split nodules, amorphous flakes and chips, which show traces of trimming in one instance only.

2. The order revealed at Cnoc Sligeach in 1913 (Fig. 91) was found to agree in the main with that disclosed at Caisteal-nan-Gillean. The cuttings showed the principal constituent to be blown sand resting upon smoothed rock and interrupted by beds of shingle and occupation-refuse, of a maximum thickness of 4 to 5 feet; the whole was overgrown with heather and grass. It has been argued that the intercalations prove that the site was inhabited before the permanent retreat of the Early Post-Glacial sea, which could at times wash the encampment and compel the squatters to withdraw temporarily.[2] However, the photographs accompanying the excavation report suggest that the sporadic shingle was not water-laid, as was that which

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[1] Bishop, 1914.

[2] Ibid., pp. 67 ff.

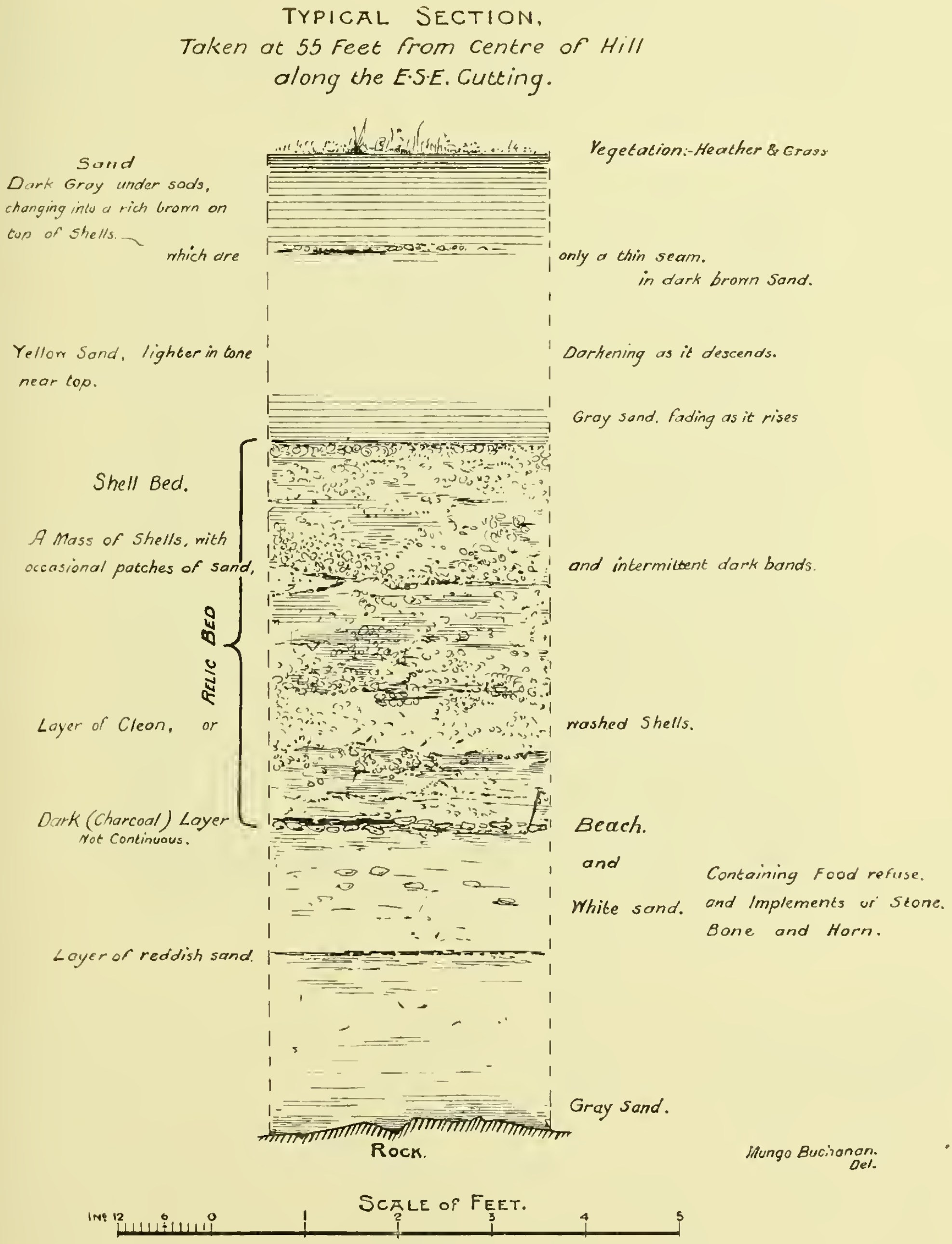
TYPICAL SECTION,
Taken at 55 Feet from Centre of Hill
along the E·S·E. Cutting.
Sand
Dark Gray under sods, changing into a rich brown on top of Shells.
which are
Vegetation:-Heather & Grass
only a thin seam.
in dark brown Sand.
Yellow Sand, lighter in tone near top.
Darkening as it descends.
Gray sand, fading as it rises
Shell Bed.
A Mass of Shells, with occasional patches of sand,
and intermittent dark bands.
RELIC BED
Layer of Clean, or
washed Shells.
Dark (Charcoal) Layer
Not Continuous.
Beach.
and
White sand.
Containing Food refuse.
and Implements or Stone.
Bone and Horn.
Layer of reddish sand.
Gray Sand.
ROCK.
Mungo Buchanan.
Del.
SCALE OF FEET.
INS 12
6
0
1
2
3
4
5

FIG. 91. Typical section in Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

was found to enclose midden materials in the MacArthur Cave, Oban, and in the raised beach of the Firths of Clyde, Forth, and Tay. A better explanation has been advanced by an observer long familiar with the prevailing conditions during the tempests which so often sweep Oronsay with hurricane force. It is that the shingle was not a wave-borne deposit, but the storm-carried infilling of hollows after the land had been re-elevated.[1] Similarly, the local smoothing of the underlying rock could be attributed to the driven sand-blast.

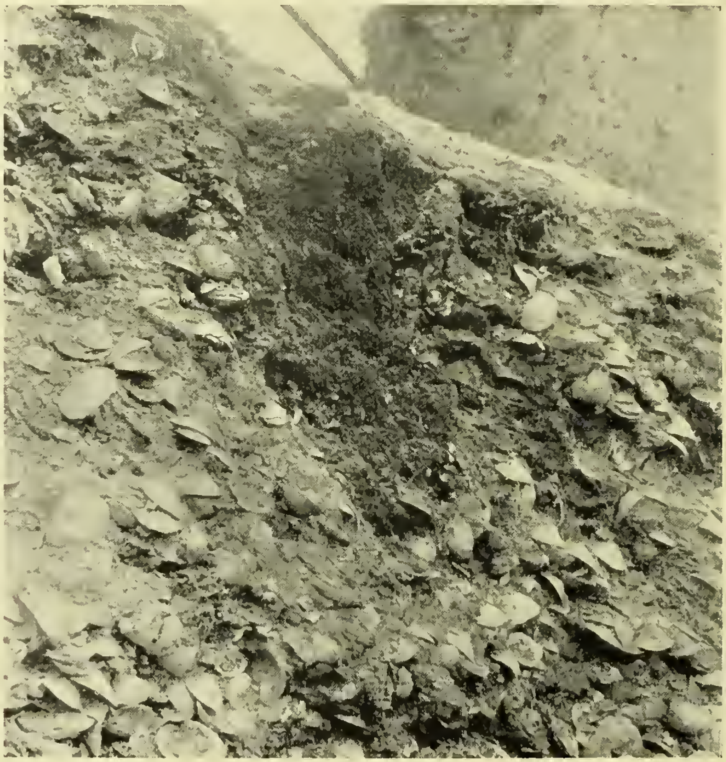

FIG. 92. Section of a post-hole in shell-refuse, Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

All the animal forms recorded from other Obanian middens, besides several unnoticed before, are included in the imposing list of vestiges identified in the refuse (Table V). Molluscan shells—notably limpet—predominate as usual, and to these must be added the remains of crustaceans, the bones of many kinds of fishes and birds, cetaceans and other mammals. Some of the last could only have been hunted on the larger neighbouring islands, and possibly also on the mainland.

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[1] S. Grieve, 1923, pp. 41–44.

Six holes penetrated the midden; they were disposed around a hollow on top of the refuse (Fig. 92). It is thought that they had held stakes to support a shelter erected long after the Obanian occupation.

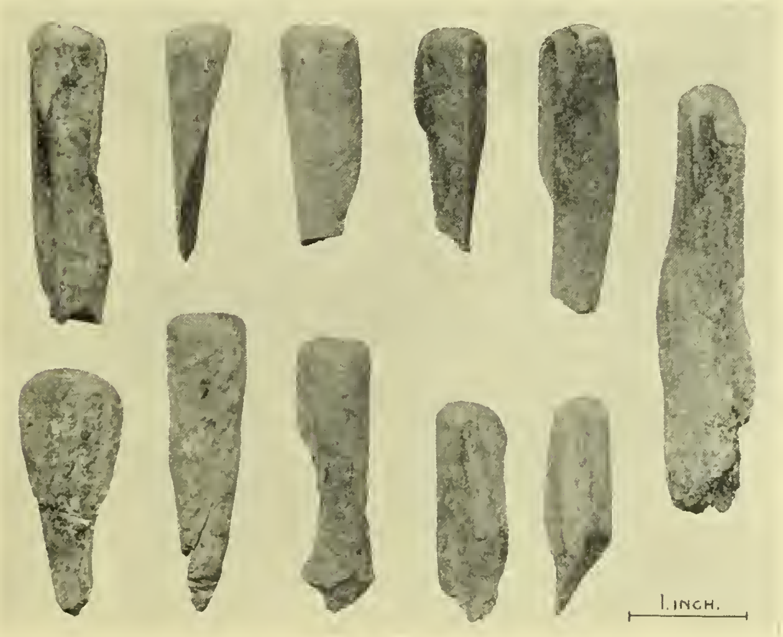

FIG. 93. Obanian implements of bone and red deer antler from Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

The archaeological material from the second excavation on Cnoc Sligeach, now deposited in the Hunterian Museum at Glasgow, includes all the classes of Obanian relics recovered as a result of earlier investigations. It is also enriched by artifacts and objects which throw additional light on the shell-mound folk and their industries.

This assemblage is composed mostly of the characteristic bone, antler (Fig. 93), and pebble-implements (Fig. 94) end-worn in various ways. Like their counterparts from the neighbouring Oronsay sites and from the Oban caves, they can be fairly separated into different groups according to their distinguishing marks of wear. In all these lots from Cnoc Sligeach, numbering close on 2,000 specimens, the stone examples far exceed those of bone and antler. Small finger-like pieces occur in all three materials, and it has been claimed, on the strength of actual trials with rods of cement (e.g. specimen on right, lower row of Fig. 94), and with the support of the negative evidence of the absence of comparable forms from inland sites, that they were used for scooping limpets from the shell.[1] Recent experiments to the same end with bone and antler slivers and with pebbles have produced signs of attrition which, if not so positive as is claimed for the cement rods, are certainly not unlike those on many of the prehistoric objects. It is possible, therefore, that among so many enigmatic components the Obanian groups may include yet another category of elementary implements.

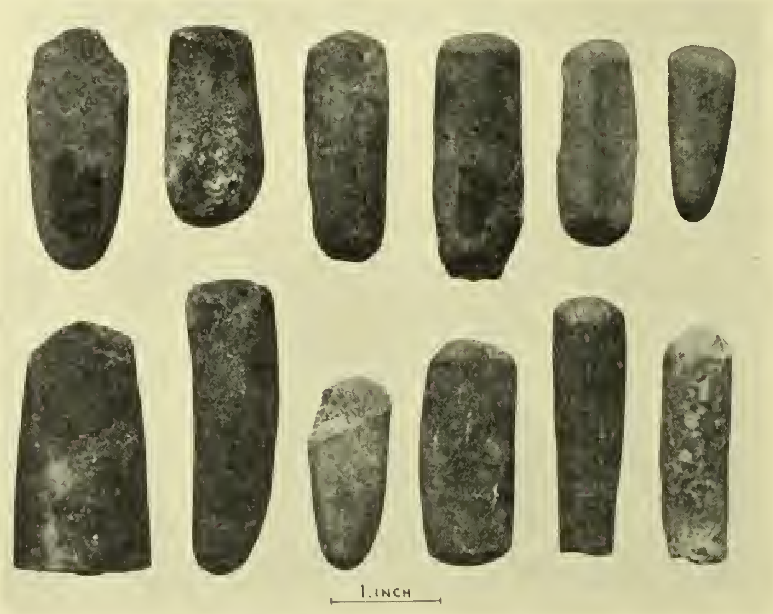

FIG. 94. Obanian pebble-implements from Cnoc Sligeach, Oronsay. (After Bishop 1914.)

Bone. Several fragments of large implements made from the beams of stag antler are present. On each of these (e.g. Fig. 95) enough remains of an area flattened by grinding or rubbing on the inner side to show that they may be classed with the large imperforate bone tool from Caisteal-nan-

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[1] Bishop, 1914, p. 95.

Gillean (Fig. 87, no. 4). They are probably cognate, therefore, with the pieces of antler bearing traces of a circular holing from the Druimvargie shelter, Oban (p. 208). The size of all these suggests tools of the nature of blubber-mattocks for dealing with thickly lined carcasses and skins, such as those of seals and cetaceans. This opinion is upheld by the fact that the bones of these animals have been found among the refuse.

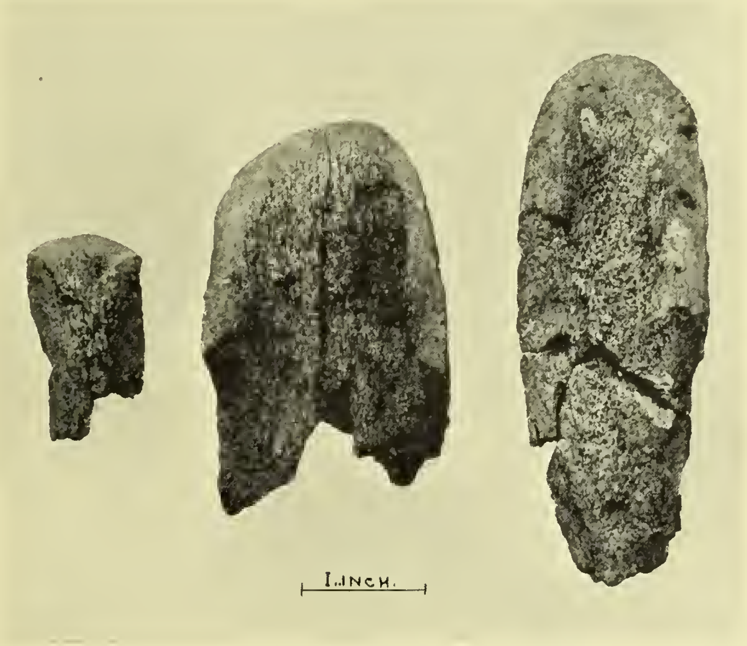

Fig. 95. Obanian antler implements from Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

Among smaller objects there appear antler-tines grooved or worn at the tip, thick-bodied, well-rounded, and sharply-pointed borers or awls of bone, needle-like points and a variety of pins made of bone, and pieces of bone showing traces of rubbing or smoothing (Fig. 96). A short, channelled pebble, worn in the groove, and bits of pumice-stone, furrowed or hollowed by friction, are certainly hones and grindstones used in the manufacture of articles of bone and antler (e.g. the two dark objects on the left of Fig. 96).

Barbed fish-spears are represented (Fig. 97), one made of antler (no. 1), six of bone. All are broken, and three are reduced to mere fragments, of which one (no. 2) with the vestiges of a barb is recognizable as a tip. Of

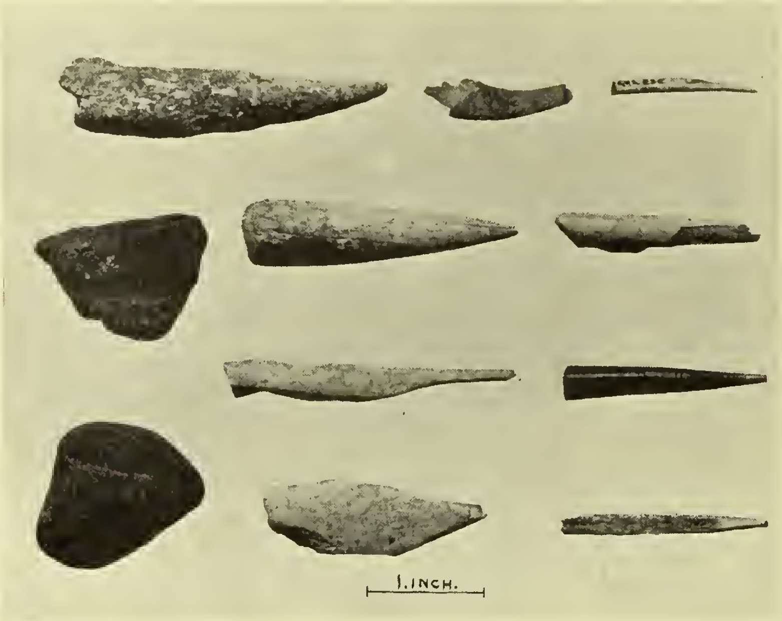

FIG. 96. Pins and points of bone, and hones of pumice-stone, from Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

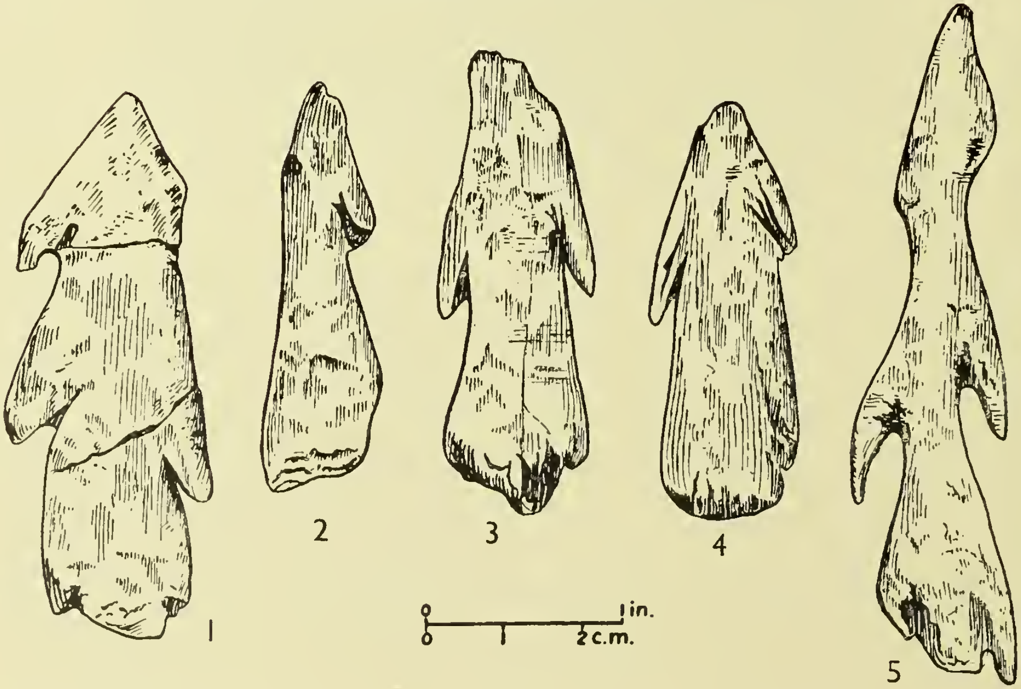

FIG 97. Obanian barbed points of red deer antler and bone from Cnoc Sligeach, Oronsay. (Redrawn by Movius, 1942, from Breuil, 1922.)

the others, three (nos. 3–5) are upper fragments, one (no. 4) apparently given a new butt. They retain short jags cut alternately along their two sides, and they are of the same character as the barbed points from the MacArthur Cave, Oban, and Caisteal-nan-Gillean, Oronsay. All these, of biconvex section, differ in their style of barbing from this specimen (no. 5), the barbs of which protrude on both sides like thorns from a thin round stem. For its closest analogy one has to turn to Mesolithic forms from Denmark. Hence this relic is important when considered with other Obanian forms which link the western Scottish culture with the relics of Baltic type from the North Sea basin.

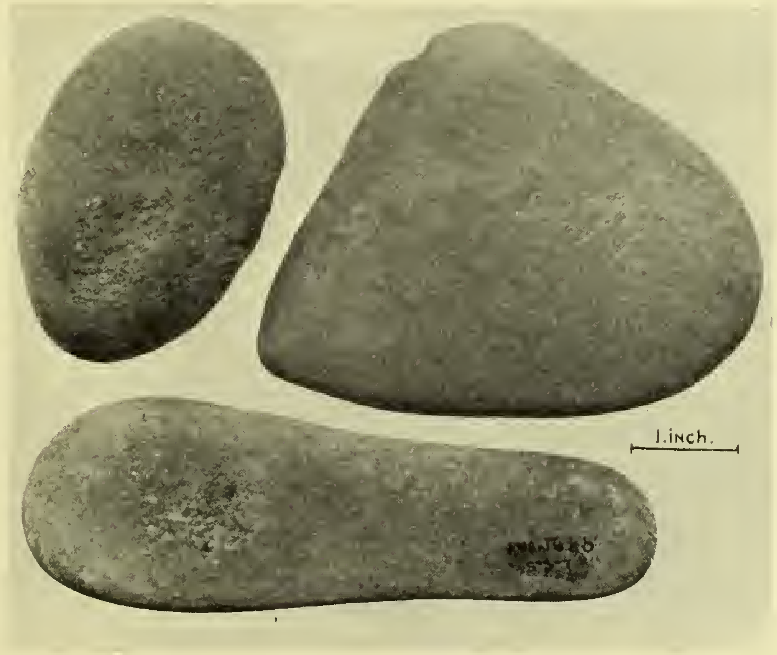

Fig. 98. Obanian hammer-stones and anvils from Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

Stone. Variously injured stones, such as fire-cracked hearth elements and others, abraded and pitted from use as blocks, anvils, and hammers, can be added to the catalogue (Fig. 98). Flints, however, are fewer than from the refuse first dug into, nearer the crest of Cnoc Sligeach. They consist of a handful of simple flakes, none retouched but some much bruised, scaled, and edge-worn, greatly similar to those from Caisteal-nan-Gillean (p. 218, and Fig. 89).

A scraper (Fig. 99, upper row, left), which shows a concave working-edge made along the inner margin of a large crescentic pebble, illustrates the treatment of material of naturally convenient shape. Massive scrapers are represented by a tool (upper row, right), boldly edge-flaked in a quartzite cobble. Similar treatment has converted long pebbles into efficient choppers (e.g. the largest specimen of Fig. 99). These flaked implements, belonging to the category recognized in the assemblage from Caisteal-nan-Gillean, are the equivalents of the coarse heavy flint tools, picks and the like, which in the Atlantic drainage region first appear in strength in the Late Larnian industries.[1]

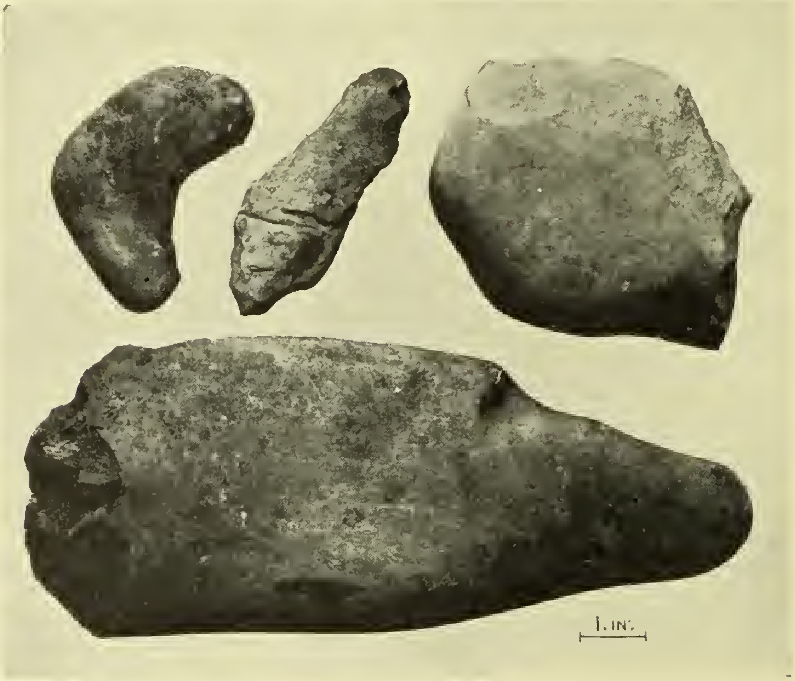

FIG. 99. Obanian massive stone implements from Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

Shell. Among the shells of pecten sorted from the occupation-refuse excavated on Cnoc Sligeach in 1913, five are worn smooth outside and

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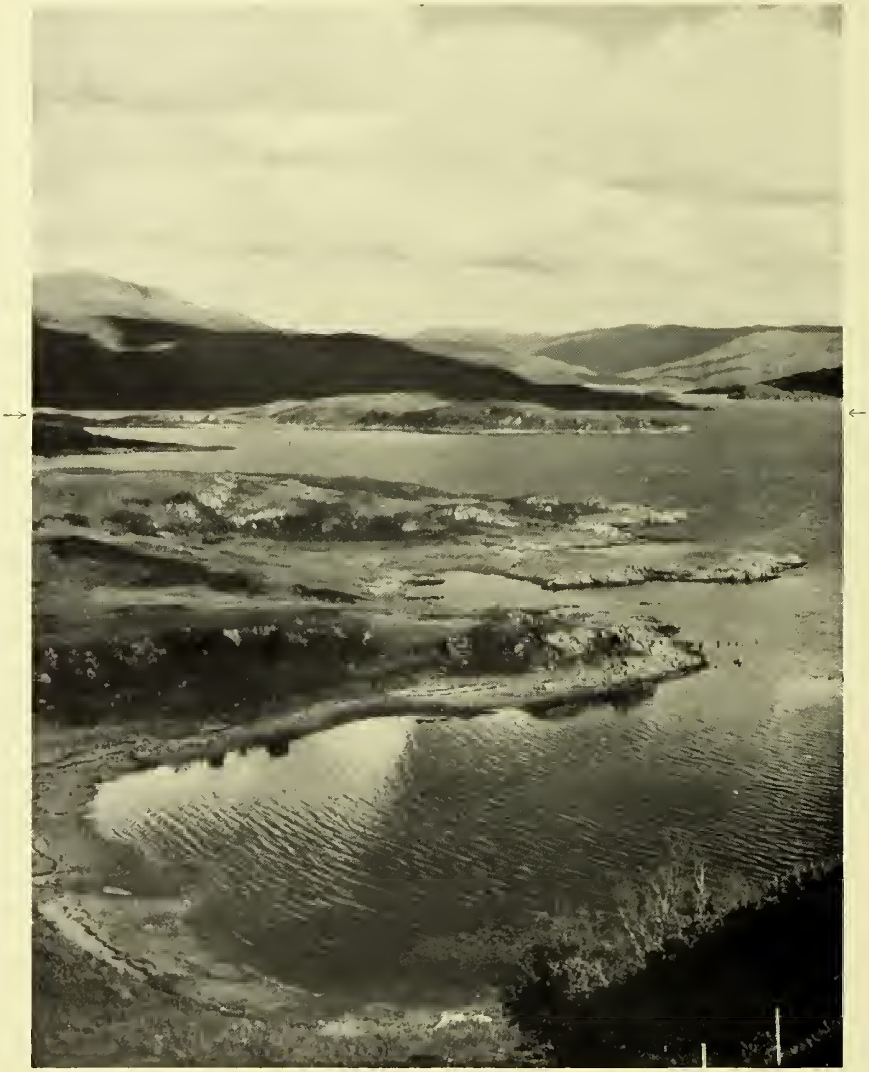
[1] Movius, 1942, pp. 159–70.

PLATE VIII



RISGA ISLAND (INDICATED BY ARROWS) IN LOCH SUNART, ARGYLL, FROM GLEN BORRODALE CASTLE

The shell-bed is on the left of the island.

(*From a photograph by A. A. MacGregor, London.*)

inside the margin, as if from considerable service as scoops or ladles (Fig. 100). Also, most of the numerous cowrie-shells (the local *Trivia*) are perforated in two places (Fig. 101). The holes occur invariably in the same place, which suggests that the shells were pierced for stringing as ornaments.

3. CNOC RIACH. Although no report of the excavation of Cnoc (Croch) Riach ('The Brindled Mound') appears to have been preserved, the collection from this site is fortunately stored in the National Museum of Antiquities. Its character suffices to identify it with the assemblages from the two other Oronsay sites. There are seventy of the typical end-abraded, finger-like, and blunt-edged implements, ranging from 3·5 to 19 cm. in length, four formed of red deer antler, sixteen of bone, and fifty consisting of utilized pebbles. The longest bear such characteristic scars of attrition that they may be ranked with the implements which are believed to be limpet-hammers. The list is completed by forty untreated flint chips.

(B) RISGA

The rocky islet Risga (Pl. VIII), belonging to the small archipelago in the narrows of Loch Sunart, lies a furlong from the north shore, twelve miles east-south-east of Ardnamurchan Point. Its relics of occupation, which afford many standards for comparison and correlation, are derived from a kitchen-midden excavated in 1920. This refuse was fully 1 foot thick, and spread over a narrow shelf of rock, whose outer edge stands some 30 feet above the water,[1] or within the transgression of the Early Post-Glacial sea.

The materials from Risga are deposited in the Hunterian and Kelvingrove Museums at Glasgow. Showing no signs whatever of disturbance by waves, they are quite free of such beach deposits as sand and shingle. In their animal and archaeological contents they are virtually the same as the relic-beds of the Oban caves and Oronsay shell-mounds. By far the largest part consists of molluscan shells. With these are mingled fish-bones and scales, the remains of crustaceans, and the bones of sea-fowl and mammals. Though much fractured and crushed, the bony matter is yet fairly fresh-looking. This has facilitated the task of identifying the species represented in the deposit, and enumerated in the list (Table V). Since Risga is but 30 acres in area, the land-forms represented must have been hunted on the adjacent wooded mainland. The seasonal occupation of Risga is therefore

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[1] G. Macdonald, 1921, p. 38.

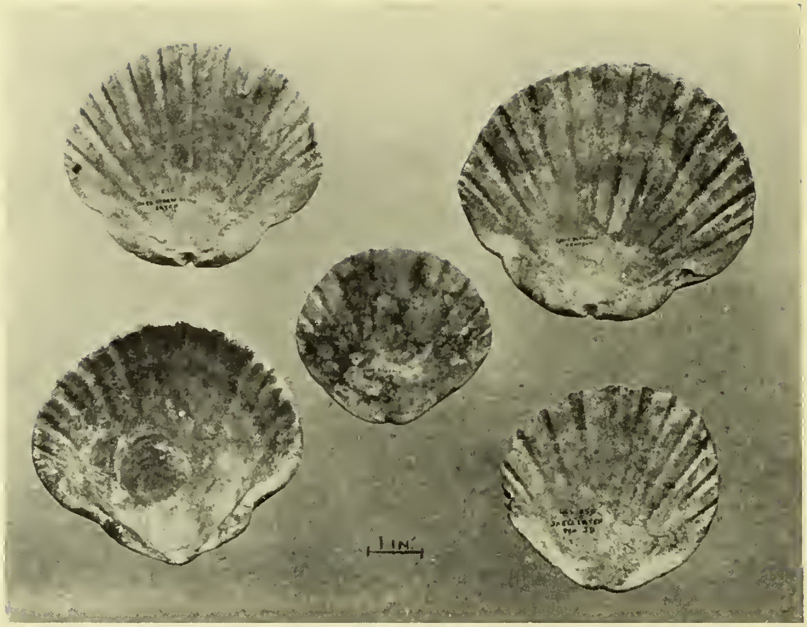

FIG. 100 Pecten shells, worn by use along the edges, from Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

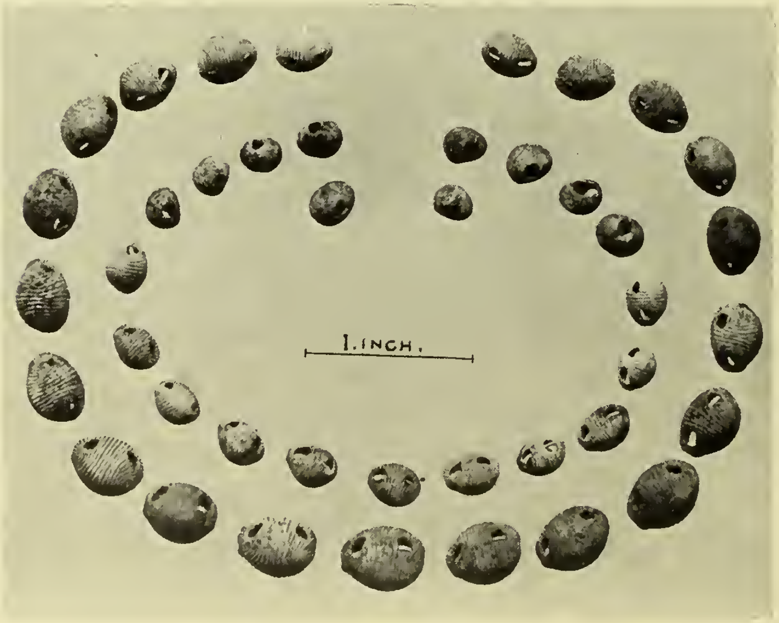

FIG. 101. Cowrie-shells, doubly perforated, from Cnoc Sligeach, Oronsay. (After Bishop, 1914.)

indicated; besides, it can hardly be imagined that the exposed island could have been occupied all the year round.

Bone. Risga, like other Obanian sites, has yielded numbers of rudimentary implements of bone and antler. Many suggest that these substances were worked in the same way as flint. The most frequent, however, are end-worn splinters. Variants formed from bone are illustrated in Fig. 102. In no. 1 the bevel appears on a flattish face, in no. 2 on a convex, and in no. 3 on a

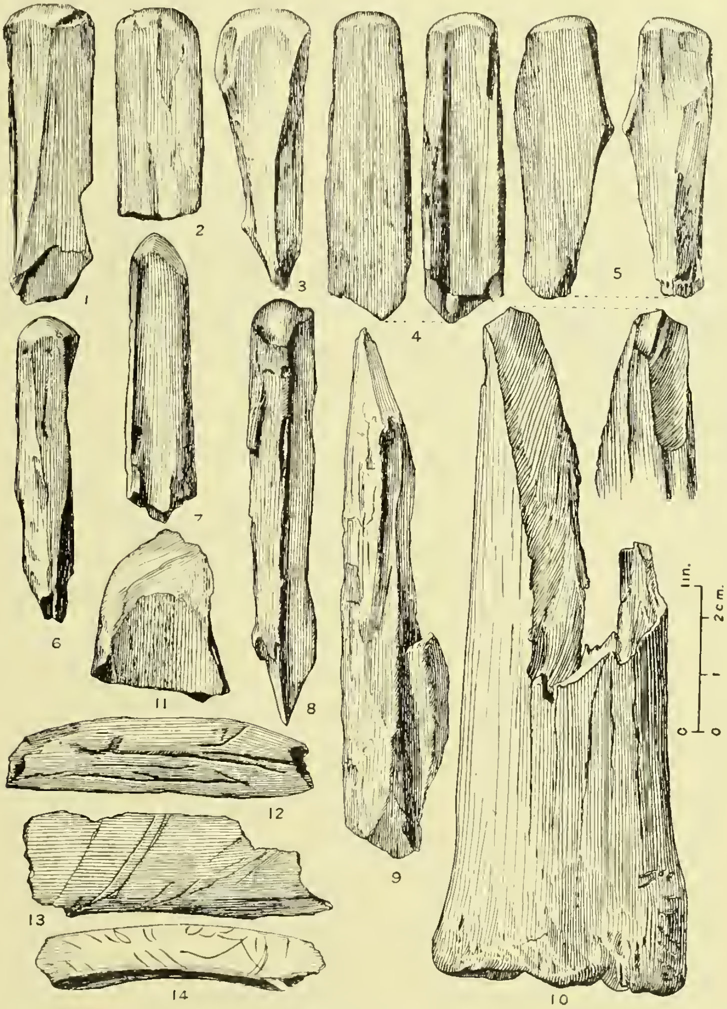

FIG. 102. Obanian implements of bone and red deer antler from Risga, Loch Sunart, Argyll. (Nos. 1–14.)

slightly concave surface. A convex and a concave face are affected in no. 4. One of the two flattish faces of no. 5 is scarred by short flaking. The end of no. 6 is rubbed to a perfect round, that of no. 7 obliquely on both sides. No. 8 is a dual-purpose tool, its upper end worn and its lower pointed by treatment of the sides. No. 9 appears to have been detached by percussion from its parent, but it cannot be determined whether this is an implement or waste from manufacture. No. 10, part of a metacarpal bone of red deer, was possibly split by the insertion of a wedge and flaked on one side of the resulting prong, leaving the condylar process to serve as a grip, as in the tools from the MacArthur Cave. No. 11 is interesting as a fragment rubbed to a polished edge; no. 12 is remarkable for its superficial scoring with a sharp instrument; while nos. 13 and 14 stand out for their fine markings which may represent feeble attempts at ornamentation.

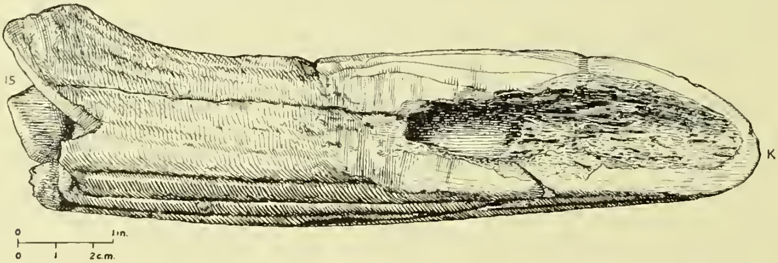

FIG. 103. Obanian tool made in red deer antler from Risga. (No. 15.)

Among the heavier tools, which probably served for stripping large carcasses, is the longest example found in Scotland (Fig. 103, no. 15). Formed from the beam of a stag's antler, it is worn quite smooth at the ground end. The other may have been perforated for hafting. Also belonging to this class of Baltic types is a remnant in antler (Fig. 104, no. 16) which matches exactly specimens from Cnoc Sligeach (pp. 224–5 and Fig. 95). Referable probably to the same category, no. 17 is illustrated as one of the many tools brought, like a stone implement, to a transverse edge by short flaking.

Barbed bone points are represented by a tip (no. 18) and an imperforate butt (no. 19). These are sufficient to show that when complete the implements were identical with the commoner forms of fish-spears from Oban and Oronsay. No. 20, a bone point having one side extended as a barb, is exceptional. Specimen no. 21 is grooved alternately in the bulging shank near the thin end, and, though now lacking the point, appears to be an armature rather than an adjunct of clothing or personal adornment. That the latter was fashionable on Risga, as on Oronsay, is suggested by some perforated cowrie-shells and pieces of red and brown raddle.

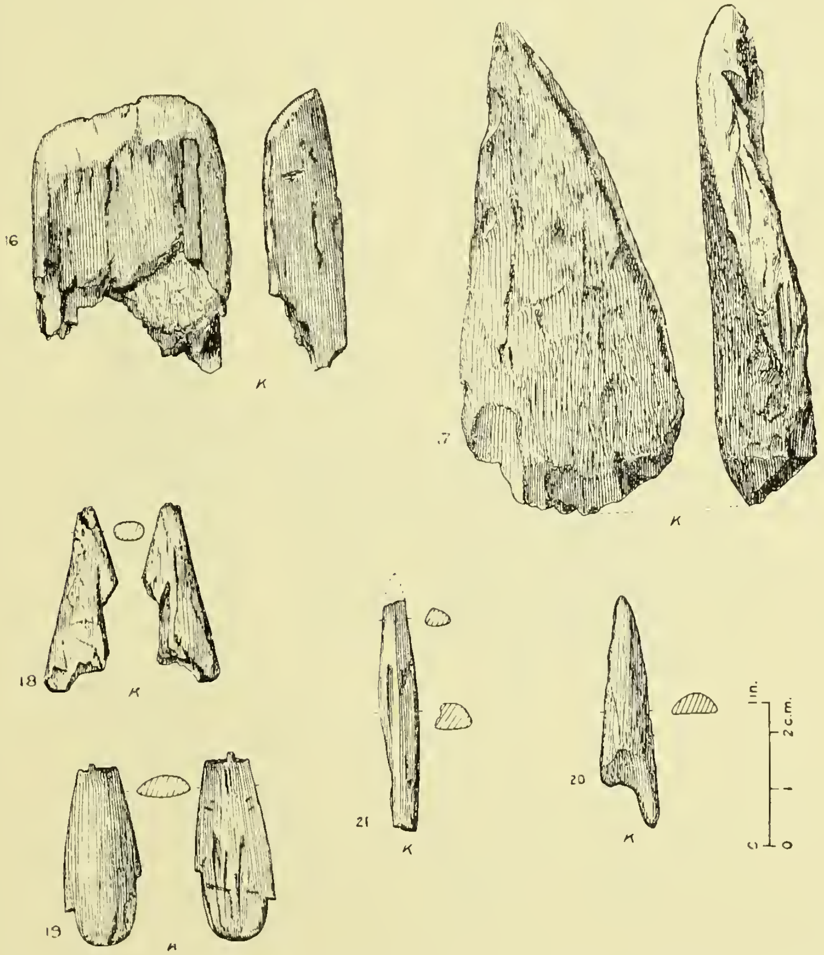

FIG. 104. Obanian implements of bone and red deer antler from Risga. (Nos. 16–21.)

Stone. In contrast to the occupation-refuse at Oban and Oronsay, that of Risga has yielded few short pebble-tools with ground or worn ends. Also, the Risga assemblage includes few stone counterparts of the narrow finger-like simple bone and antler implements which are so common (in the same high proportion to other pieces) at other Obanian sites. Remarkable, too, is the lack of roughly edge-chipped beach pebbles, such as appear at the stations mentioned above. The scarcity of the one and the absence of the other may be due to the fact that an active flaking industry in tractable materials flourished on Risga. The collection, however, includes larger flattish pebbles which exhibit the same abrasions at the end, sometimes with scars (e.g. Fig. 105, no. 1), as those believed to have served elsewhere as limpet-hammers. Immense numbers of holed shells support the view that they were so used on Risga. Hammer-stones occur, several certainly associated with the flaking technique, together with burnt hearth-stones, pitted blocks, and anvils and hones which were probably connected with bone-working. To all these may be added massive, untreated and unworn, long stones which could have been used to club the wingless great auk and seals.

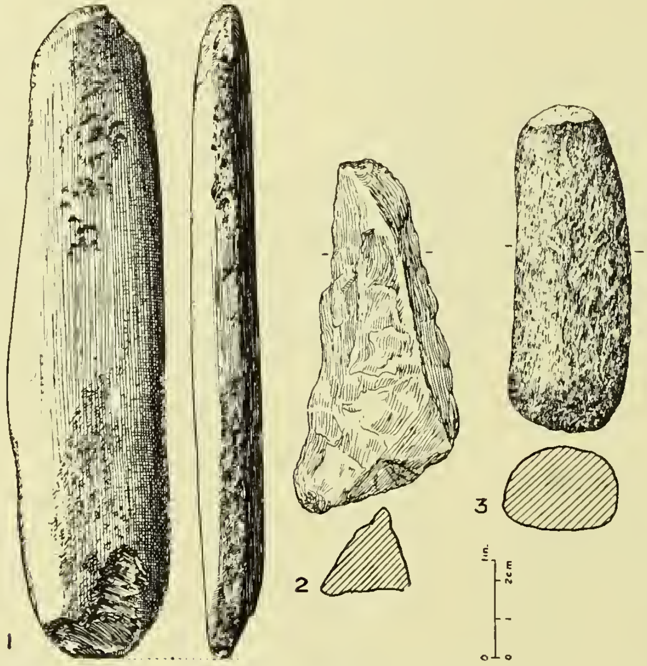

Fig. 105. 'Limpet-hammers'. (No. 1 from Risga; no. 2 from Morar; no. 3, modern.)

The collection from Risga, unlike the other Obanian assemblages, includes the very large output of a flaking industry. This is accounted for by the fact that the settlers had access, in Morven probably, to one of the rare native sources of flint in Scotland. The light implements, which they manufactured in fawn, grey, and striped green varieties, reveal that in quality the flint is generally but little superior to the native quartz also employed here. Since an apparently unlimited supply of tractable material was obtainable by the Risga Obanians, none of the artifacts manufactured from it exhibits those signs of hard wear and injury which distinguish the much-used flints from Oban and Oronsay. Most of those from Risga therefore retain their pristine freshness, though many are patinated.

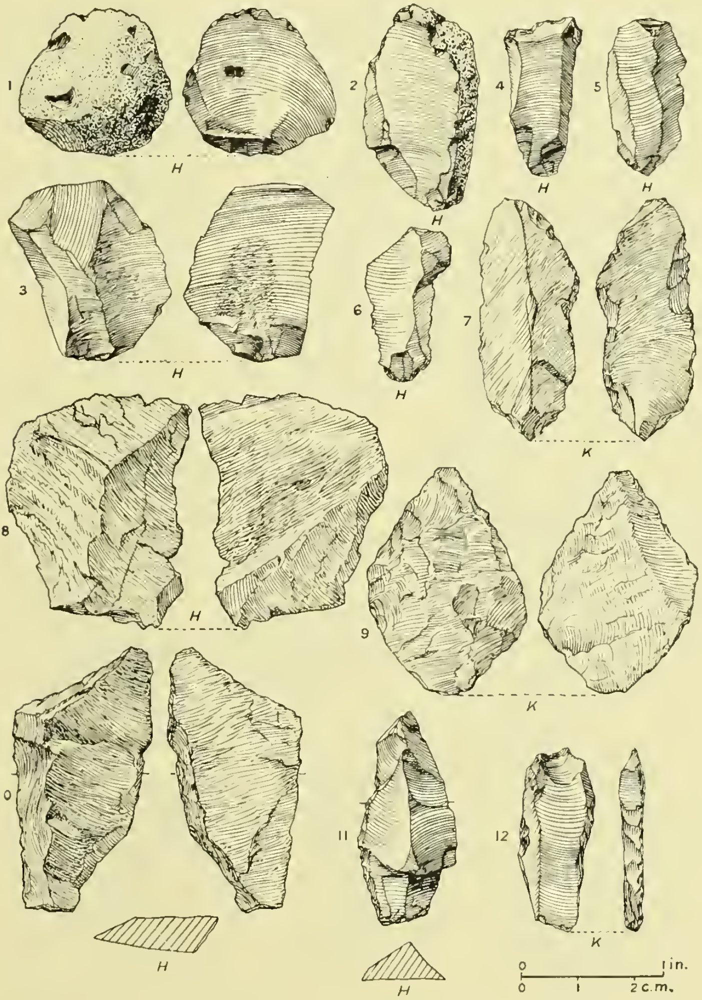

FIG. 106. Obanian flaked stone industry from Risga. (Nos. 1–6, 11–12, flint; nos. 7–10, quartz.)

In its comprehensiveness the Obanian flaking industry of Risga compares with a Larnian. A representative selection is illustrated (Figs. 106, 107, and 108, embracing nos. 1–29 inclusive).

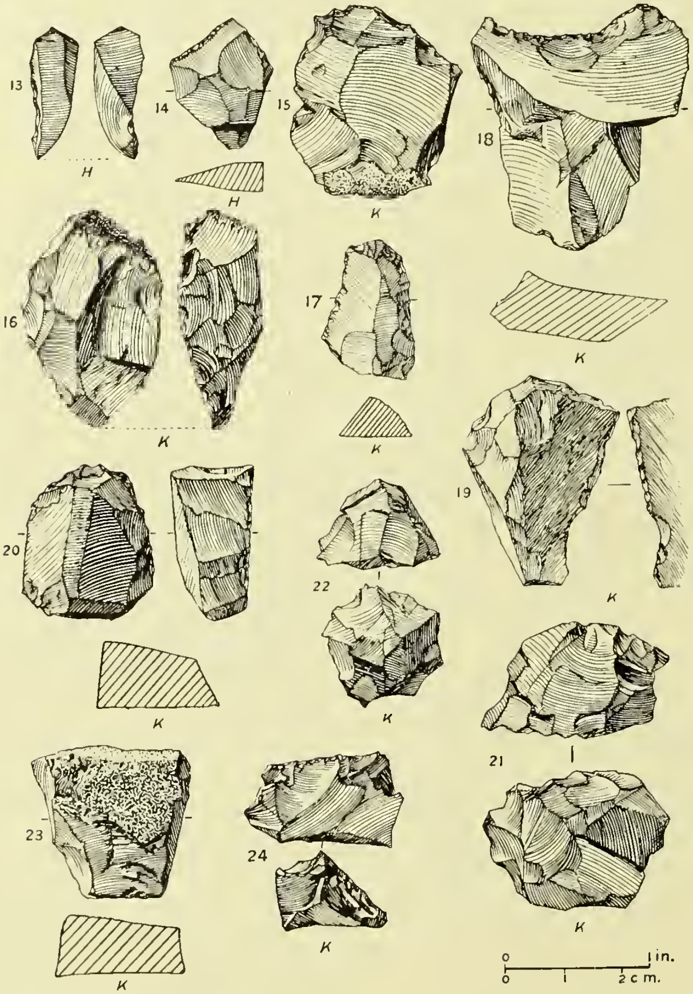

Fig. 107. Obanian flaked stone industry from Risga. (Nos. 13–18, 20–24, flint; no. 19, quartz.)

Flint flakes are typified in nos. 1 and 2, the first a primary specimen struck from a pebble, the second from prepared material. Blades of flint are represented by nos. 3–6, no. 4 being characteristically worn at an end, and no. 7, quartz, trimmed and worn along the edges. The untreated quartz flakes are compared, in the drawings of nos. 8 and 10, with examples trimmed by the removal of slivers. The shallow scars resulting from the detaching of squill-like flakes from the face of no. 9 (quartz, and possibly an armature) show that the Risga knappers had an inkling of the developed methods which first appear in the advanced Early Larnian industries of Kintyre under some Baltic influences (p. 149). More usual and delicate edge-dressing appears along the edge of the flint no. 11. The steep retouch along

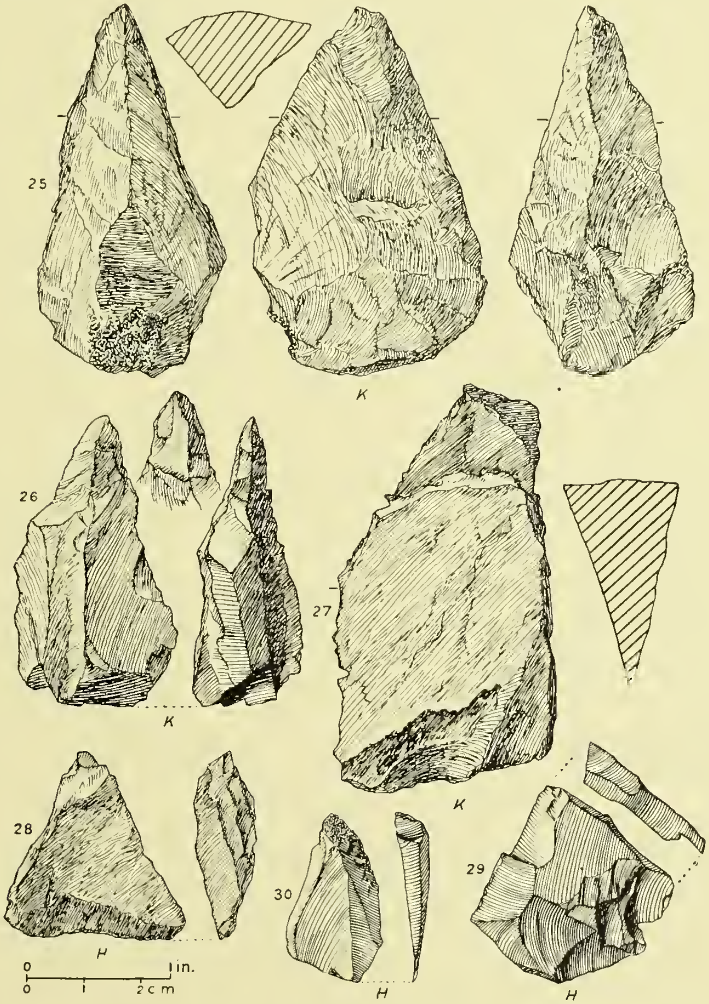

FIG. 108. Obanian flaked stone industry from Risga. (Nos. 25–28, quartz; nos. 29–30, flint.)

the right edge of the flint no. 12 was presumably applied to provide a finger-rest, as in some Larnian forms which show the Upper Palaeolithic ancestry of the coastal Mesolithic of north-east Ireland and south-west Scotland.

The Risga series includes Tardenoisian forms, simpler even than in the Larnian of the south-west, probably because of the poor grade of flint used. One, trimmed steeply in microlithic style (no. 14), is figured with a typical notchless upper end micro-burin, the waste of an abruptly blunted blade (no. 13).

Well-defined but usually crudely retouched scrapers on thick flakes and pieces are common. The representative series figured includes an end-scraper (no. 15), a side-scraper (no. 16), a compound scraper (no. 17), and a concave scraper (no. 18). The last resembles the 'fish-tail' forms of the early post-Mesolithic industries on the Irish and Scottish shores of the North Channel. These tools developed from Larnian prototypes, and were probably used in the preparation of wooden shafts. No. 19, a compound tool made in a quartz flake, is one of several examples which are interesting because of their fine, steep, inverse retouch. It will be recalled that this style of dressing first appears in the Atlantic drainage region in Scotland, as in north-east Ireland, among artifacts of the Late Larnian facies (Fig. 56, no. 12, and p. 135). Steep scrapers, as no. 20 (flint), are common. The type is distinguishable from the true, profusely flaked cores, which, though not numerous, show by the irregularity of their scars that much of the flint was difficult to work. Specimen no. 24, which is characteristic, confirms this in its resemblance to so many products of the Oronsay flaking industries.

Among the heavier tools manufactured in quartz on Risga, pick-like objects stand out, e.g. a large flake-implement, no. 25, and no. 26, made from a lump. These strongly resemble forms devised in the Larnian industries of north-east Ireland, the 'Cushendun pick' of the early facies,[1] and its derivatives of the later. The specimens from Risga, like the Larnian tools and the coarsely worked pebbles from the Oronsay sites, particularly Caisteal-nan-Gillean, must have been made in response to a need common to generations of strand-loopers on the Atlantic seaboard.

Simple cutting-tools, probably for dealing with wood, bone, and antler, are frequent. The most outstanding are elementarily treated on one or two faces to a chisel- or adze-like cutting edge (e.g. nos. 27 and 28). Bruises at the upper end of several suggest use with a heavy hammer. That these

[1] Movius, 1942, p. 157.

objects may be regarded as crude *tranchets* is justified when the antecedents of the culture represented at Risga are considered, and by the recognition of the type in industries at coastal sites from the North Channel and far beyond. They may be classed with the heavy, simply sharpened pebbles from Caisteal-nan-Gillean kitchen-midden, which, as seems likely, were used for wood-working.

Gravers, presumably for working bone, have a place in the same tool-kit. Poor but characteristically faceted flint specimens are recognizable (e.g. no. 29) and spalls from their manufacture (as no. 30). Such tools, it has been remarked, occur in the early Mesolithic industries associated with the Early Post-Glacial raised beach in the south-west. But relics of the bone-work with which they must have been connected have not yet been found there. Hence particular interest attaches to the Obanian gravers recovered with artifacts in the manufacture of which they were employed.

6. THE AGE AND AFFINITIES OF THE OBANIAN CULTURE

It has been shown in the fifth chapter that the Late Larnian facies from the deposits of the Early Post-Glacial raised beach of north-east Ireland and south-west Scotland is a development of the Early Atlantic climatic phase. To the same period of Post-Glacial time the antler tools of Baltic type from the carse-clays around Stirling may also be assigned. Between these two groups and the Obanian remains there is a great difference in age. Several facts suggest that the Obanian culture is later than the Larnian.

1. (i) The assemblages from the Oban caves, which open on the Early Post-Glacial raised beach from 20 to nearly 50 feet above, and far from the present beach, cannot be older than Late Atlantic. The refuse could only have accumulated *after* the re-elevation of the land had begun. For, even if man had reached the region before the beginning of this uplift, say during the preceding period of submergence earlier in the Atlantic climatic phase, he could not have inhabited the caves. At that time they would be in course of formation and would naturally be subject to the full influx of the sea. Yet, as the lowest refuse beds (Deposit 1) in MacArthur's Cave occurred between shingle from a secondary storm beach, it is evident that the Early Post-Glacial sea had not receded far, at least during the early part of the occupation.

(ii) The situation and composition of the Oronsay shell-heaps shows that these also belong to the period of land recovery following the regression of the Early Post-Glacial sea. All of them lie from 22 to 24 feet above O.D. along or upon the beach which registers the maximum of the marine transgression, or upon rock weathered after being raised above the reach of the waves. The character of the intercalated materials indicates that winds and storms, and not the sea, were responsible for depositing the sand and shingle which interrupt the refuse beds.

(iii) The Risga midden is also referable to the period of uplift, as is shown from its lie on a rock 30 feet above the water, within the area invaded by the Early Post-Glacial sea. Had the site been occupied during the preceding submergence, the settlers' refuse would have been swept away. Also, since the materials were found to be undisturbed and quite free from gravel and sand, it is concluded that the land must have emerged considerably before this islet became the resort of food-collectors.

2. Among the animals represented in the Obanian middens, and listed in the accompanying table (Table V), the northern mollusc *Cyprina* [*Arctica*] *islandica* (Linn.), noted from Caisteal-nan-Gillean and Cnoc Sligeach, indicates that the optimum of the Atlantic climatic phase had passed when the refuse was accumulated.[1] The finding of other animal forms also leads to this conclusion, since they are all members of the fauna which exists today on the western seaboard of Scotland. The garefowl or great auk, however, disappeared from these shores long before 1844, when it was extinguished in Iceland;[2] and the wild pig and *Bos longifrons* have lost their identity by domestication. A fresh-looking bone of sheep from Caisteal-nan-Gillean can be dismissed as a relic from near the surface, unconnected with the underlying Obanian refuse. So also can remains of such quite modern introductions as rat and rabbit from Cnoc Sligeach. Bones thought to have been gnawed by dogs have been reported from a cave at Oban, but not positively from the Obanian midden materials. Though the dog itself is represented at Oban in the MacKay Cave, which may have been inhabited by man in a late stage of the native Mesolithic culture, yet its bones are recorded from deposits which have been too much disturbed to enable us to conclude that the animal was there as the tamed companion of the occupants.

3. From the aspect of some barbed bone and antler points, the industries designated as Obanian have often been termed Azilian or Scottish Azilian. Even this qualified designation is inapposite, since Baltic Forest culture

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[1] Movius, 1942, p. 181.

[2] S. Grieve, 1885, pp. 3 and 21.

TABLE V

Fauna represented at Obanian sites

FAUNA		SITES								
		OBAN						ORONSAY		RISGA
		MacArthur Cave Lower beds	MacArthur Cave Upper beds	Druimvargie Rock-shelter	Mackay Cave	Gasworks Cave	Distillery Cave	Caisteal-nan-Gillean	Cnoc Sligeach	
MARINE MOLLUSCA										
GASTROPODA										
Limpet	*Patella vulgata* L.	..	×	×	×	×	×	×	×	×
	Gibbula [*Trochus*] *cineraria* (L.)	..	..	..	..	..	..	..	×	..
	G. umbilicalis (da Costa)	..	..	..	..	..	..	..	×	..
Periwinkle	*Littorina littorea* (L.)	..	×	×	..	..	..	×	×	×
	L. littoralis (L.) [= *obtusata* auctt.]	..	..	..	..	..	..	..	×	..
Cowrie	*Trivia* [*Cypraea*] *monacha* (da Costa) [= *europaea* auctt. in part]	..	..	..	..	..	..	×	..	..
	,, ,, ,, *arctica* (Montagu) [do.]	..	..	..	..	..	..	..	×	..
	Nucella [*Purpura*] *lapillus* (L.)	..	..	..	..	..	..	..	×	..
	Ocenebra [*Murex*] *erinacea* (L.)	..	..	..	..	..	..	..	×	..
Whelk	*Buccinum undatum* L.	..	×	..	..	..	×	×	×	×
LAMELLIBRANCHIA										
Mussel	*Glycymeris* [*Axinaea, Pectunculus*] *glycymeris* (L.)	..	..	..	..	..	×	..	×	..
	Mytilus edulis L.	..	×	..	..	..	×	×	×	..
	Modiolus barbatus (L.)	..	..	..	..	..	..	..	×	×
Oyster	*Ostrea edulis* L.	..	×	×	..	×	×	..	×	..
	Pecten maximus (L.)	..	×	×	..	×	..	..	×	..
Scallop	*Chlamys* [*Pecten*] *opercularis* (L.)	..	×	..	..	..	..	×	..	×
	'*Pecten*' sp.	..	×	..	..	..	..	..	×	..
	Cyprina [*Arctica*] *islandica* (L.)	..	..	..	..	..	..	×	×	..
Spiny Cockle	*Cardium echinatum* L.	..	..	..	..	×	×	×	×	×
	C. tuberculatum L.	..	..	..	..	..	..	..	×	..
	C. crassum Gmelin [= *norvegicum* Spengler]	..	..	..	..	..	..	×	×	..
	C. sp.	..	×	..	..	×	..	..	..	×
	Venus verrucosa L.	..	..	..	..	..	×	..	×	..
	V. casina L.	..	..	..	..	..	..	×	×	..
	Paphia [*Tapes*] *rhomboides* (Pennant) [= *virginea* auctt.]	..	×	..	..	..	..	×	..	..
	P. pullastra (Montagu)	..	..	..	..	..	..	×	..	..
	P. decussata (L.)	..	×	..	..	..	..	..	×	..
Razor-shell	*Ensis* [*Solen*] *ensis* (L.)	..	×	..	..	..	×	..	×	..
Pod razor-shell	*E. siliqua* (L.)	..	..	..	..	..	..	..	?	..
	Mya sp.	×	..	×	..	..	..	..	×	..
	Hiatella [*Saxicava*] sp.	..	..	..	..	..	..	..	?	..
LAND MOLLUSCA										
	Carychium minimum (Müller, *sensu lato*)	..	..	..	..	..	..	..	×	..
	Cochlicopa lubrica (Müller)	..	..	..	..	..	..	..	×	..
	Pupilla [*Jasminia*] *muscorum* (L.)	..	..	..	..	..	..	..	×	..
	'*Pupa*' sp.	..	..	..	..	..	..	..	×	..
	Vallonia pulchella (Müller, *sensu lato*)	..	..	..	..	..	..	..	×	..
	Clausilia bidentata (Ström)	..	..	..	..	..	..	..	×	..
	Discus [*Pyramidula*] *rotundatus* (Müller)	..	..	..	..	..	..	..	×	..
	Vitrea crystallina (Müller)	..	..	..	..	..	..	..	×	..
	Retinella [*Hyalinia*] *nitidula* (Draparnaud)	..	..	..	..	..	..	..	×	..
	'*Hyalinia*' sp.	..	..	..	..	..	..	..	×	..
	Helicella caperata (Montagu)	..	..	..	..	..	..	..	×	..
	Cochlicella [*Helicella*] *acuta* (Müller) [= *barbara* auctt.]	..	..	..	..	..	..	..	×	..
	Cepaea [*Helix*] *nemoralis* (L.)	..	..	..	..	..	..	..	×	..
	,, ,, ,, 'var. *alba*' Baudon	..	..	..	..	..	..	..	×	..
CRUSTACEA										
Common Crab	*Cancer pagurus* L.	..	..	..	..	..	..	×	×	×
Fiddler-crab	*Portunus puber* (L.)	..	..	..	..	..	..	..	×	×
	Cancer sp.	×	×	..	..	..	×	×	..	..
MAMMALIA										
Man	*Homo sapiens* L.	..	×	..	×	?	×	..	?	..
Bat	'*Vespertilio*' sp.	..	×	..	..	..	..	..	..	..
Fox	*Vulpes* sp.	..	..	..	×	..	..	..	..	..
Dog	*Canis* sp.	..	..	..	×	..	..	..	..	..
Badger	*Meles meles* (L.)	×	×	..	..	..	..	..	..	..
Otter	*Lutra lutra* (L.)	×	..	×	×	..	×	×	×	×
Marten	*Martes foina* (L.)	..	..	..	..	..	..	×	..	×
Cat	*Felis* sp.	×	..	..	..	..	..	..	..	..
Weasel	*Mustela* sp.	..	..	..	×	..	..	..	×	..
Grey Seal	*Halichoerus gryphus* (Nils.)	..	..	..	..	..	..	×	×	×
Common Seal	*Phoca vitulina* L.	..	..	..	..	..	×	×	×	×
Rabbit*	*Oryctolagus cuniculus* (L.)	..	..	..	..	..	..	×	..	..
Hare	*Lepus* sp.	..	..	..	×	..	..	..	..	..
Vole	*Arvicola* sp.	..	..	..	×	..	..	..	..	..
Rat*	*Rattus* sp.	..	..	..	..	..	..	×	..	..
Red Deer	*Cervus elaphus* L.	×	×	×	×	..	×	×	×	×
Roe Deer	*Capreolus capreolus* (L.)	×	×	..	×	..	..	..	..	..
Goat	*Capra* sp.	..	..	..	×	..	..	..	..	..
Celtic Ox	*Bos taurus* L. var. *longifrons* (Owen)	×	×	..	×	..	×	..	..	..
Sheep*	*Ovis aries* L.	..	..	..	..	..	..	×	..	..
Wild Boar	*Sus scrofa L.*	×	..	×	..	..	×	×	×	×
Rorqual	*Balaenoptera* sp.	..	..	..	..	..	..	×	..	×
Dolphin	'*Delphinus*' sp.	..	..	..	..	..	..	..	×	..
AVES										
Wild Swan	*Cygnus* sp.	..	..	..	..	..	..	×	..	..
Goose	*Anser* sp.	..	..	..	..	..	..	..	×	×
Sheldrake	*Tadorna tadorna* (L.)	..	..	..	..	..	..	..	?	..
Red-breasted Merganser	*Mergus serrator* L.	×	×	×	×	..	×	..	×	×
Cormorant	*Phalacrocorus carbo* (L.)	..	..	..	..	..	..	..	×	×
Shag	*P. aristotelis* (L.)	..	..	..	..	..	..	..	×	×
Gannet	*Sula bassana* (L.)	..	..	..	..	..	..	..	×	×
Ringed Plover	*Charadrius hiaticula* L.	..	..	..	..	..	..	..	?	..
Common Tern	*Sterna hirundo* L.	..	..	..	..	..	..	..	×	×
Gull	*Larus* sp.	..	..	..	..	..	..	..	×	×
Razorbill	*Alca torda* L.	..	..	..	..	..	..	×	×	×
Great Auk	*Alca impennis* L.	..	..	..	..	..	..	×	×	×
Guillemot	*Uria aalge* (Pontoppiden)	..	..	..	..	..	..	×	×	×
Water-rail	*Rallus aquaticus* L.	..	..	..	..	..	..	..	×	×
Birds undetermined		×	×	..	..	..	..	..	..	..
PISCES										
Tope	*Eugaleus galeus* (L.)	..	..	..	..	..	..	..	×	×
Picked Dog-fish	*Squalus acanthias* L.	..	..	..	..	..	..	×	..	×
Angel-fish	*Squatina squatina* (L.)	..	..	..	..	..	..	..	×	×
Thornback Ray	*Raja clavata* L.	..	..	..	..	..	..	..	×	..
Skate	*R. batis* L.	..	..	..	..	..	..	×	..	×
Conger-eel	*Conger conger* (L.)	..	..	..	..	..	..	..	×	×
Saithe	*Gadus virens* L.	× ?	× ?	..	..	..	..	..	×	..
Haddock	*G. aeglifinus* L.	..	..	..	..	..	..	..	..	×
Sea-bream	*Pagellus centrodontus* (de la Roche)	..	..	..	..	..	..	..	×	..
Black Sea-bream	*Spondyliosoma cantharus* (Gmelin)	..	..	..	..	..	..	..	×	×
Wrasse	*Labrus bergylta* Ascanius	..	..	..	..	..	..	×	×	..
Grey Mullet	*Mugil capito* Cuvier	× ?	× ?	..	..	..	..	×	..	×
Fishes undetermined		×	×	×	..	..	×	..	×	×

* Bones appear to be quite recent.

traditions and other strains have been detected in the bone-work and in the flaking technique. While one can ignore the suggestion that the remains are of Azilian age, it is only fair to remember that authoritative geological opinion held long ago that a considerable period separated the Pyrenean epipalaeolithic culture from the Oban cave industry. The former was referred to the 'Lower Forestian' climatic epoch, and the latter to the 'Upper Turbarian'.[1] As shown above (Table III, p. 77), these constitute respectively the Boreal and Atlantic climatic phases.

The accuracy of the ascription of the full Azilian culture is now proved. It has therefore to be conceded that elements of this facies could conceivably have reached Argyll by Late Atlantic times. But, against this, as we have seen in Chapter IV, is the fact that vestiges of the Azilian culture are unknown in the north of France and southern Britain. Actually the distribution of the Azilian in France corresponds almost exactly to that of the parent Late Magdalenian. Moreover, owing to the probable limits of the territory reclaimed from the Channel, and to the north-easterly situation of the land-bridge during the Boreal emergence (see map, Fig. 20), it is more than doubtful if Azilian strains ever penetrated into Britain, where only the slightest traces are suggestive of the Magdalenian.

Lacking precise details of discovery, the few and variant barbed antler and bone points from the north of England, as at Victoria Cave, Settle, and Whitburn, Co. Durham, and from Cumstoun, Kirkcudbright, and Shewalton, Ayrshire, in southern Scotland, cannot, on the strength of general resemblance, be accepted as evidence of Azilian infiltration. One should regard these objects as developments on some other facies, or as of local invention, as are the many Neolithic and Bronze Age barbed fish-spears recorded from Continental inland sites. This then, rather than a blending of Azilian and Baltic traditions,[2] would be exemplified in the ensemble of Obanian bone-work. It is not so remarkable, however, that this side of the industry should show Baltic features, since colonists possessing a basically Maglemosean equipment settled in south-east Britain and spread beyond in the North Sea basin (pp. 114–19) and up valleys in Scotland (pp. 165–75, 195).

It is probable that Tardenoisian and Baltic strains were borne northward along the coast with the Larnian tradition (basically of Creswellian origin), to which they had contributed in the south-west during an early part of the Atlantic climatic phase.[1] Some Baltic influences, such as appear in the larger adze- and chisel-like bone and antler implements, may also have gained the west by internal routes. In this respect, the squat, well-flaked *tranchets* and other heavy stone tools from sites in Luss parish, Loch Lomondside (Fig. 76), though not strictly datable, point to the penetration inland of Baltic ideas.[2] These ideas may have entered this district, which would be particularly attractive to fowlers and fishers, as an extension of the human movement commemorated by the antler implements recovered from the carse-clays around Stirling (pp. 169–74). These, it is recalled, belong to an early part of the Atlantic climatic phase, when, owing to the invasion of the Early Post-Glacial sea, the Forth valley was fenland, if not actually an arm of that sea, as far west as Gartmore. Not more than six miles then separated this locality from the undrained marshes in the lower reaches of the Endrick Water, the principal feeder of Loch Lomond on its east side. Taking all these factors into account, we see no chronological difficulty in assuming that these Mesolithic cultural strains could have reached Loch Lomond and spread from it to the western seaboard by Late Atlantic times. The greater valleys, Glenfalloch, Strathfillan, and the Loch Awe drainage, suggest one of the ways by which they could have passed.

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[1] J. Geikie, 1914, p. 298.

[2] Cf. Childe, 1931, p. 333.

4. The remoteness of the Obanian sites makes it certain that they were reached by man only long after the first Larnian colonists had alighted on the extended coastal grounds of the Firth of Clyde. Even by navigation the northward advance of the successors of the primordial settlers must have been slow along the indented coast. In the course of this progress local facies would evolve in response to the environment of the small communities of strand-loopers. Such is the hybrid stone and bone industry represented in the collections from Oban, Oronsay, and Risga. That from Risga differs from the others only by its far richer element of flaked and retouched stone artifacts.

The situation of the Oronsay and Risga middens strongly suggests contemporaneity with the Early Neolithic industries yielded by the overburden of the Early Post-Glacial raised beach in north-east Ireland and south-west Scotland. Referable at the earliest to the very end of the Atlantic climatic phase, but mainly to the Sub-Boreal, and coeval, therefore, with the full English Neolithic, these industries will be considered in another chapter. Further researches may well establish that the outposts

[1] McCallien and Lacaille, 1941, pp. 81 and 91.

[2] Lacaille, 1940, pp. 6–8.

of the Obanian culture are not earlier than of full Sub-Boreal age, after, say, 1500 B.C., for archaeological evidence showing the persistence of Obanian traditions can already be added to the stratigraphy and geographic considerations, which indicate that the Oban caves were occupied earlier than the islands Oronsay and Risga.

The flaking industry of Risga alone demonstrates that the Obanian culture did not replace the Larnian but was a regional development of it.[1] It also permits us to make a better assessment of the whole culture, to trace its antecedents, and eventually to follow its influences beyond the place made classic by the first discoveries. From its beginnings as shown in MacArthur's Cave, Oban, during the advanced part of the Atlantic climatic phase to its later but similar expression, as typified on Oronsay and Risga, those who practised this culture continued in the economy of the Old Stone Age. The Obanian culture therefore belongs to the Mesolithic complex of the British Isles.

The persistence of the western Scottish Mesolitnic tradition is seen in several stone industries from mainland coastal sites north of Risga and on a few islands, including Colonsay. It is not surprising that it should appear on Colonsay, to which the lesser Isle of Oronsay is almost completely tied. Among suggestive forms collected on Colonsay there are flint tools of archaic aspect and characteristic long, worn, flat pebbles identical with those from the shell-mounds and cave-refuse (see pp. 297–8). Investigations here may therefore show the presence of true Obanian sites. It is also thought that inquiries in other islands and on the mainland in the West Highland area, of which Oban is the centre, may reveal Mesolithic stations as informative as those discussed here.

5. One hesitates to add a record of unknown age to a list that already includes much of a speculative character. Nevertheless, it is tempting to think that in Argyll there may have existed hunters who were contemporary with some of the later Obanians, and who had inherited artistic traditions from, or shared artistic traditions with, Scandinavian artists of the later Stone Age. This is suggested by a small naturalistic rock-carving (Fig. 109) of a deer near Lagalochan in the wilds of Gleann Domhain, between Lochs Avich and Craignish.[2] In its treatment this carving differs entirely from the cup-and-ring markings common in this region, and from the stylistic sculpturings of animals on rock-surfaces and on monuments which were

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[1] Cf. Hawkes, 1943.

[2] Childe, 1941.

executed by quite advanced people. The Gleann Domhain deer is obviously the product of another school. If it could be proved to be referable to men living in a stage of true Stone Age culture, then it would be of far greater account than the few scratches on some Obanian bones which, as feeble attempts at decoration (as Fig. 102, nos. 12–14),[1] are so far all there is to suggest that any artistic sense was found among the early food-gatherers in Scotland.

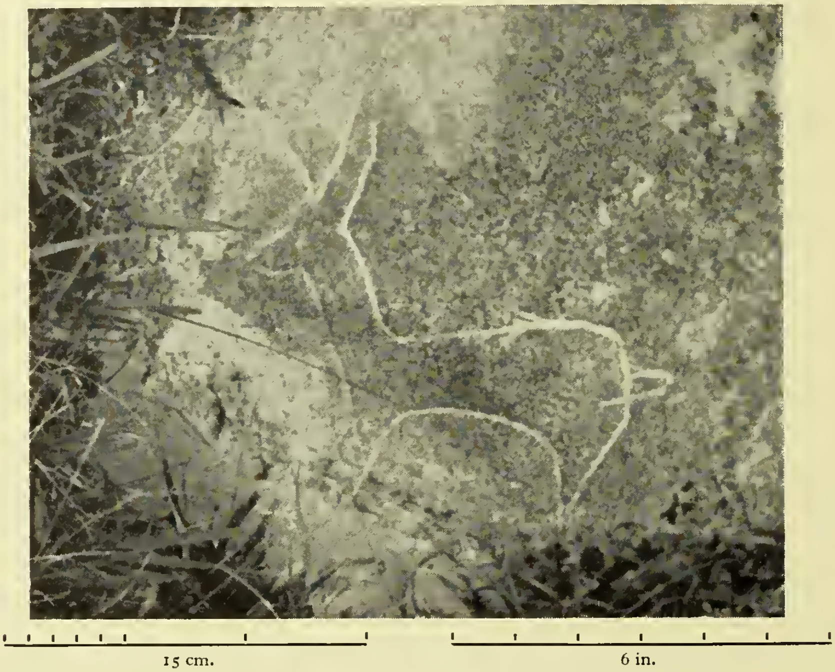

Fig. 109. Rock-engraving of a deer, near Lagalochan, Gleann Domhain, Argyll. (Photograph by V. G. Childe, 1941.)

6. Outside the West Highland region many caves opening on, and kitchen-middens standing along, the Early Post-Glacial raised beach have been explored. All have yielded food-refuse similar to that from the sites described above, but only from a few have there been recovered the implements of people whose economy was as primitive as that of the Obanians. The most significant records, coming from remote localities on the shores of the North Sea, concern archaeological remains examined in the National Museum of Antiquities and in private collections. Although

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[1] Also Bishop, 1913, p. 97.

scanty, the character and the reported mode of occurrence of these relics indicate that they are vestiges of a low and long-persisting culture, the rise of which probably synchronized with developments on the Atlantic side of the country. Even on present limited knowledge it may be surmised that this littoral culture of the North Sea basin evolved on the equivalents of the Hiberno-Scottish Larnian. These are certainly represented by the shell-refuse from inside and along the Early Post-Glacial raised beach near Inveravon, West Lothian, by the antler tools from the estuarine clays of Forth around Stirling, and by the flint industries from the gravels of the correlative beach of the Firth of Tay at the Stannergate and Broughty Ferry.

VIII

POST-MESOLITHIC DEVELOPMENTS

1. EARLY NEOLITHIC INDUSTRIES IN THE BASIN OF THE NORTH CHANNEL

EVEN before the Obanian industries were firmly established in Argyll, Neolithic colonists from the Continent had descended on the shores of Britain. Depending little on hunting, they reared cattle and raised crops, mainly south of the great Palaeozoic ridge in England. They manufactured the stone tools necessary to their crafts, made pottery, and entombed their dead in chambered long barrows and cairns. Before the Sub-Boreal climatic phase was well advanced they had spread across south Britain and were reaching southern Ireland.

As conditions favoured travel by sea, a harbinger of the Neolithic culture gained the Larnian province of north-east Ireland, apparently from northern France by way of Britain. This is thought to have been an extension of the Mesolithic heritage manifest in the western European Neolithic, as typified at Le Campigny (Seine-Inférieure) in Normandy (see pp. 122–3). The arrival of these strains in Ulster may have synchronized with the advent of the vigorous Megalithic culture of Mediterranean origin, which did not, however, attain its full expression in Ireland until the coming of metal. It was otherwise with these first immigrant strains which, by the time the re-elevation of the land was almost completed, had superseded the Larnian in the coastal grounds. As a result of contacts, some of the new industries, which had replaced the native Mesolithic, were influenced by the Megalithic culture.

(A) COASTAL SITES IN ULSTER

(i) The post-Mesolithic complex, coeval with the full English Neolithic and deriving ultimately from foreign sources, concentrated on the coasts of Antrim and Down. Its industries are distinguishable from those of the old indigenous facies by the condition and the abundance of their retouched forms. Their output includes several types taken over from the Larnian, besides many characteristic innovations, but for long no pottery or ground tools. The domestic economy of these people could not at first have differed much from that of the Larnian strand-loopers. These simple new industries, the first that may fittingly be described as *epimesolithic*, represent the Early Neolithic stage of man's cultural development in north-east Ireland. They are exemplified by relics which were previously mentioned (pp. 126, 129–30) as occurring in humus on top of the Early Post-Glacial raised beach, in Co. Antrim at Glenarm (Horizon 2—Deposit A)[1] and Cushendun (Horizon 4—Deposit A);[2] and in Co. Down at Rough Island in Strangford Lough (Horizon 2—Deposit A).[3] Therefore, as distinct from the Larnian remains, most of which have been found in secondary position, the Early Neolithic are *in situ*. They bear witness to settlement on top of the Early Post-Glacial raised beach and its equivalents. A considerable interval, therefore, separates them from the Late Larnian. Such is the character of their products that these Early Neolithic industries of the Ulster coast have been classed with the Campignian facies of France.[4] Their long descent and relations probably involved the important western province of Scotland more than can be affirmed at present. Since this consideration calls for a review of the typology of the Early Neolithic of the Ulster coast, a representative series is illustrated (Fig. 110).

(ii) The flint artifacts from the humus overlying the Early Post-Glacial raised beach in north-east Ireland are sharp, and stained or patinated in hues of ochreous, light chalky grey, dark bluish grey, and mottled green. Fine, worn blades are common (e.g. no. 1). Leaf-shaped and pointed examples, trimmed on the edges at the bulbar end, or worked to a short tang (no. 2), mark a distinct advance on Larnian prototypes. Many compound and end-scrapers on thick flakes are recorded (e.g. no. 3), but none on parallel-sided blades. A type peculiar to some stations appears in large flakes, broken across and used or retouched on the transverse edge (no. 4). A few side-scrapers (e.g. no. 5) on broad oval flakes recall Levalloisian forms. There occur some simple gravers (no. 7). Picks of the classic Larne form on plunging flakes (e.g. no. 6) illustrate the survival of Mesolithic traditions.

The principal innovations are *tranchets* on thick, short, and relatively wide flakes (nos. 8–10). As cutting-tools, the larger were probably used as axes, the smaller as chisels. A derivative, the 'fish-tail' scraper, has a similar transverse but seldom retouched edge (nos. 11–13). The convenience of this long edge and the usefulness of the angles are obvious.

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[1] Movius, 1937, pp. 210–14.

[2] Idem, 1940 (*a*), p. 63.

[3] Idem, 1940 (*b*), p. 117.

[4] Idem, 1937, pp. 210–11; 1942, pp. 211 ff.

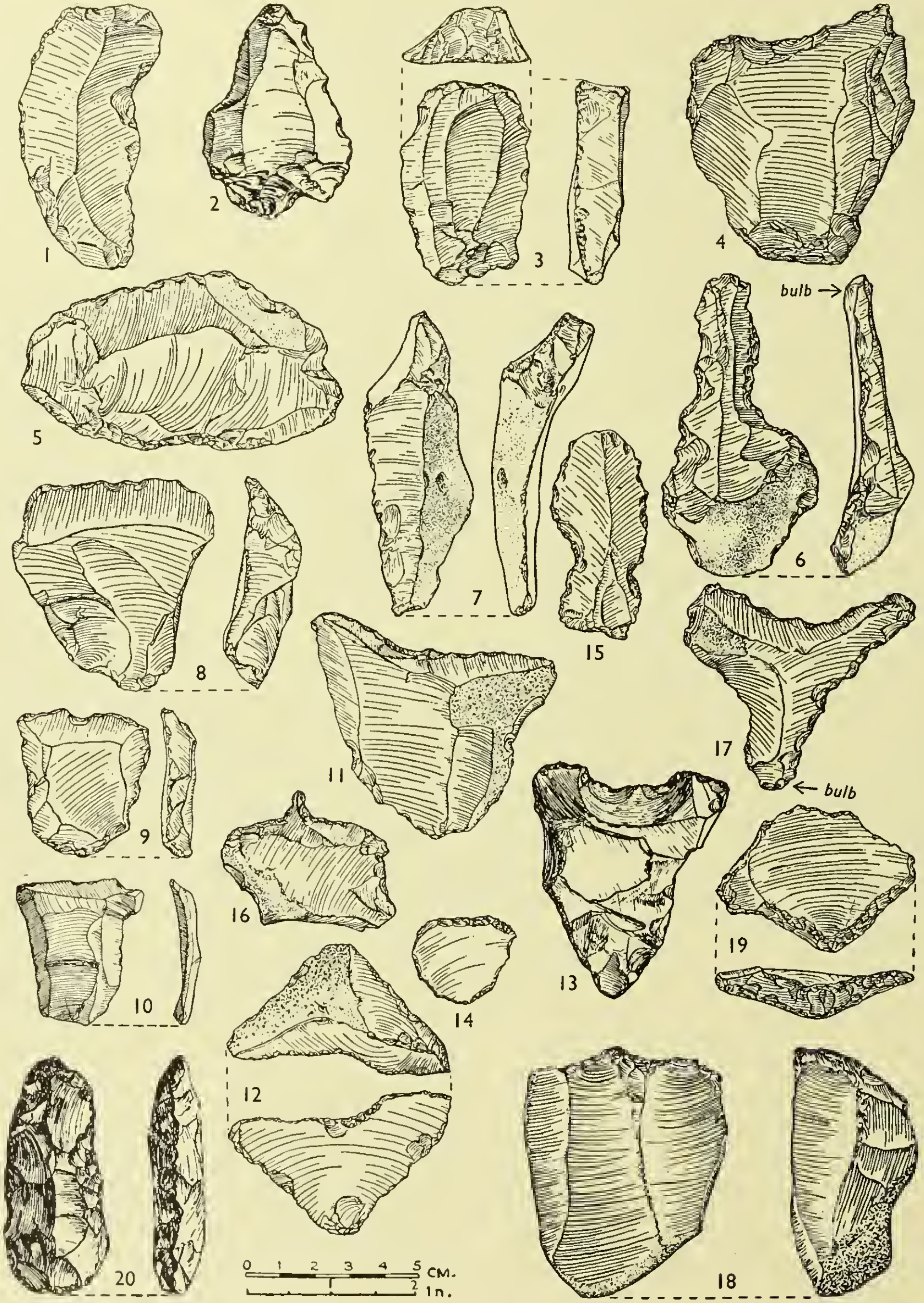

FIG. 110. Early Neolithic flints from north-east Ireland. Nos. 1, 3–12, 14–19, Glenarm (after Movius, 1937); nos. 2, 13, 20, Rough Island (after Movius, 1940(*b*)).

Identical objects have been noted in an early Campignian industry at Champlat, Boujacourt (Aisne).[1] In the Irish groups this characteristic cutting-edge is also a feature of many choppers fashioned on coarse trimming-flakes.

Small thumb-nail scrapers (e.g. no. 14) occupied as important a place in the equipment of the early post-Mesolithic coastal squatters as in that of their Larnian predecessors. A great variety of flint tools, including deeply-notched flakes (as no. 15), perforators (no. 16), reamers, and Y-shaped implements (no. 17), help to show that these industries represent the peripheral diffusion of Continental late Mesolithic and early Neolithic elements, such as are exemplified in collections from the Chalk region of south-east England (pp. 122–3).

Cores are numerous and varied in the series from the coastal sites of Ulster. The most remarkable show a striking-platform in the Levalloisian manner (e.g. no. 18). Hence the butts of many flakes are characteristically faceted (as no. 19). As in the Larnian groups, picks made on cores occur in the Early Neolithic assemblages. Quite distinct from these are several well-flaked celts or core-axes (e.g. no. 20), denoting an advance on the Mesolithic industry.

(iii) Whereas the artifacts of Late Larnian facies from the upper deposits of the Early Post-Glacial raised beach betoken faintly surviving Upper Palaeolithic tradition, the series from the humus overlying this formation illustrate the real break with the past. Locally this facies shades into something more advanced. Thus flaked aphanite axes from the deposit overlying the Early Post-Glacial raised beach at Cushendun suggest that occupation of the coastal camp-site lasted until it was at least partly contemporary with the inland axe-factories near Cushendall.[2] At one, Tievebulliagh, the main archaeological horizon overlies boulder clay, and is covered with forest peat, the base of which is probably of Sub-Boreal age. The *continuum* is also indicated by archaeological material found stratified in Rathlin Island, six miles from the coast of Ulster and twelve miles from the Mull of Kintyre. Thus, at Ballynagard, on top of glacial till, hearths were exposed under loamy clay overlaid by humus containing Late Bronze Age–Early Iron Age potsherds. With these hearths were found stone implements (Fig. 111, nos. 1–14), including a broken aphanite celt with a ground semicircular cutting-edge (no. 15). With these was the upper portion of a vessel identical with

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[1] Octobon, 1931.

[2] Movius, 1942, p. 224.

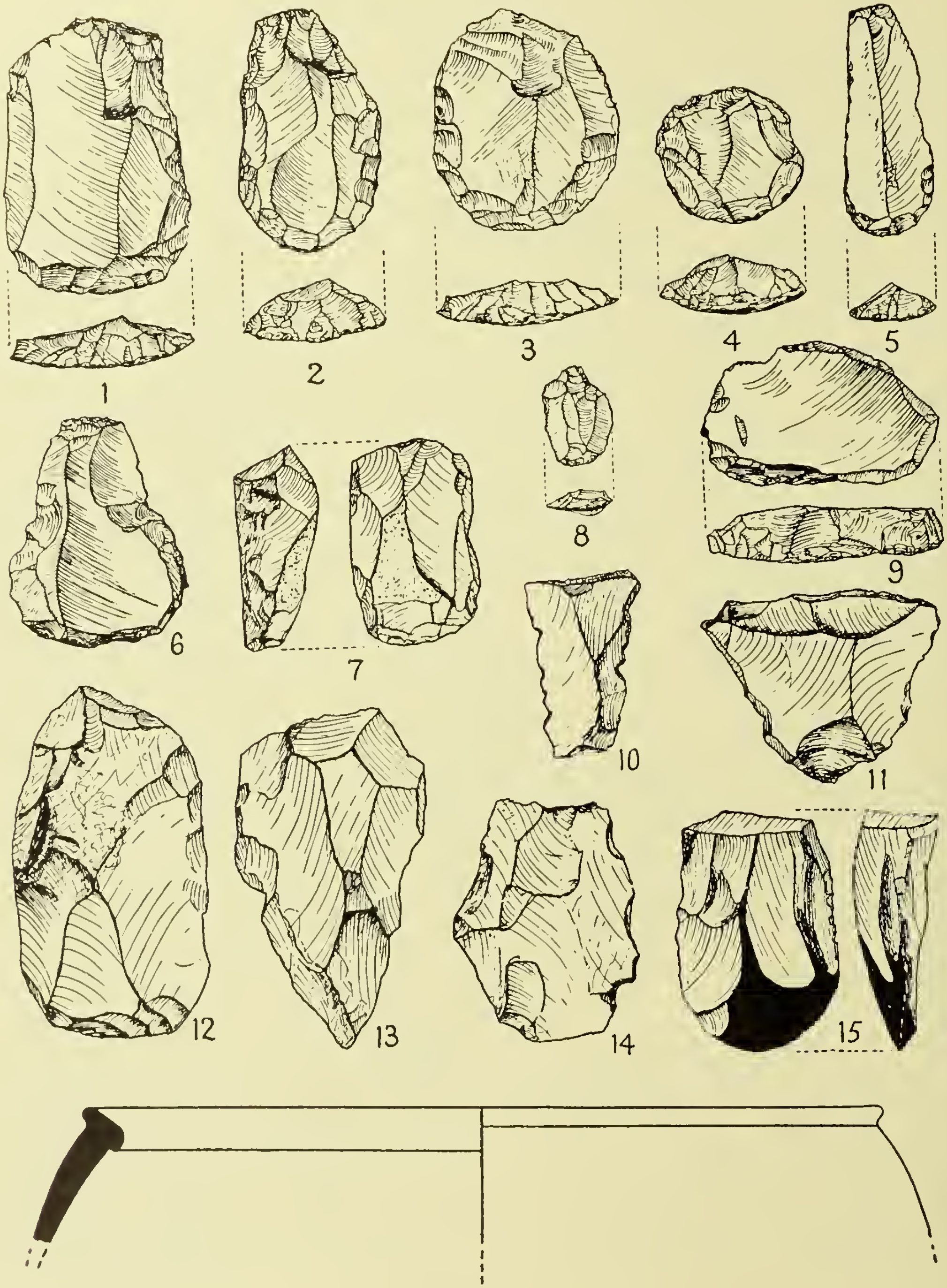

FIG. 111. Neolithic stone implements and pottery from Ballynagard, Rathlin Island. ($\frac{2}{3}$) (From Movius, 1942, after Whelan, 1934.)

British Early Neolithic ware (no 16). Belonging to the end of the Stone Age, these discoveries may eventually be shown to furnish as close a link between Ireland and Scotland as do the Mesolithic remains discussed previously, and as do the evidences of full Megalithic and later cultures which have been dealt with so brilliantly in the past few years.[1] They can be associated with another stone-knapping centre at Brockley on the western side of the island. Proof of the persistence of Stone Age traditions on Rathlin is provided at Ballynagard by surface-finds of stone picks, small *tranchets*, 'fish-tail' scrapers, leaf-shaped points, perforators, worn blades, and flaked axes, some slightly ground.

(B) THE BANN RIVER

With the post-Larnian settlement on the coastal grounds of north-east Ireland some native strand-loopers moved into the interior. The Bann River culture, apparently of fishers, stands out among inland growths on Larnian types which were influenced by contacts with the immigrants. Near the outlet of Lough Beg at Newferry, Co. Londonderry, excavations revealed the relics of this culture (Fig. 112) in diatomaceous beds which provided successive records of the fact that the river overflowed periodically.[2] Palaeobotany has shown that the main archaeological horizon belongs to the upper part of Zone VI in the Post-Glacial climatic sequence of Ireland.[3] It is therefore of Late Atlantic–Sub-Boreal age (see p. 63).

The characteristic product of the Bann River flint industry is a point, usually on a leaf-shaped blade dressed along the margins upwards from the butt (e.g. no. 1), sometimes to a short tang (as nos. 2 and 3). It is much more probable that it descends from Larnian ancestors[4] such as are illustrated in these pages, than from Baltic Forest culture as has been suggested.[5] Carefully trimmed, pointed, thick flakes and blades also occur (e.g. nos. 4 and 5). Some, treated steeply (as nos. 6 and 7), recall Upper Palaeolithic *dos abattu* implements; others, flatly retouched, show the influence of the newcomers' techniques. These appear, too, in flaked axe-heads and chisels (e.g. nos. 8 and 9), and also in small ground basalt axe-heads (e.g. no. 10). From the diatomite there have also been taken leaf-shaped arrow-heads (nos. 11–13). Sherds of decorated and lugged, round-based vessels are even

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[1] e.g. Childe, 1940.

[2] Movius, 1936.

[3] Jessen and Farrington, 1938, p. 256.

[4] Movius, 1942, p. 251.

[5] Clark, 1936 (*b*).

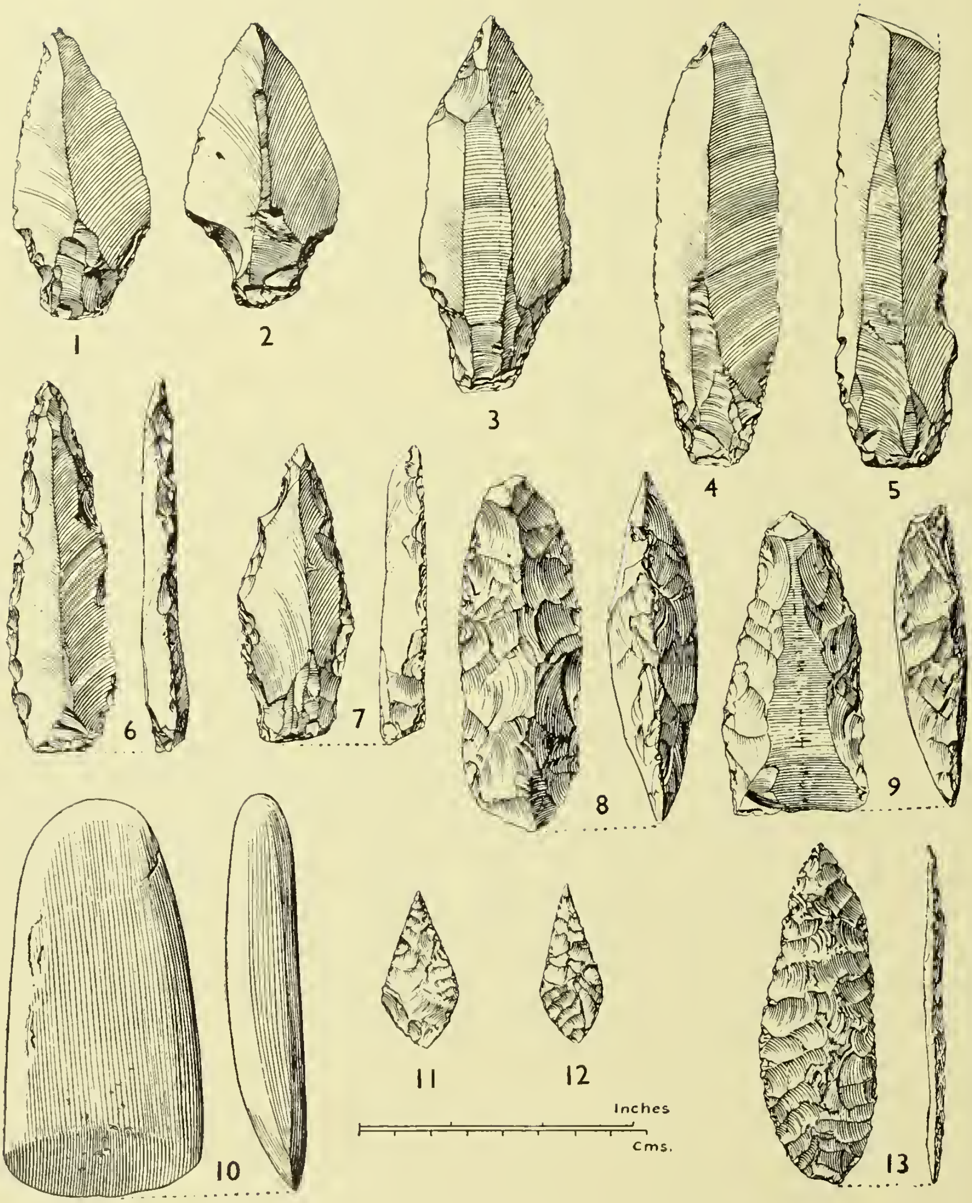

FIG. 112. Bann River culture. Representative series of stone implements. (After Whelan, 1938.)

more positive indicators of the Megalithic stamp on the development of the Bann River culture, for their affinities are with the ware from the passage-graves in the Iberian Peninsula, Brittany, Ireland, the Hebrides, Caithness, and the Orkneys.

(C) CASTLEREAGH HILLS

At this point a brief description may be given of the industry of archaic and distinctive appearance mentioned in Chapter IV (pp. 109–10), for its resemblance to one from Northumberland, and for its implements with counterparts in Scotland. The products of this industry consist principally of tools fashioned in pebbles. Entirely lacking micro-burins, they nevertheless remind us of a Tardenoisian group, although a degenerate one. This shows (Fig. 113) in the following: Nosed implements (nos. 8, 9, 16, 17, 24, and 25); core-scrapers (no. 11); geometric forms, most being thick pieces shaped by steep bold working, triangles (nos. 12, 20–23), rectangles and pentagons (nos. 18 and 19 respectively); knives (nos. 13 and 14); semicircular scrapers (nos. 26, 27, 36, 39, and 40); finely retouched points (nos. 28 and 29); delicate blades bearing minute edge-trimming (no. 30); hollow-scrapers (nos. 34 and 38); scrapers on blades, and notched flakes (respectively nos. 41 and 42); many flakes, natural or struck from lumps and cores, and blades retouched at the point of usage only. All these, and indeed the assemblage as a whole, have affinities with the Late Tardenoisian facies appearing in the Neolithic of south-western France, inland at Le Martinet, Sauveterre-la-Lémance (Lot-et-Garonne),[1] but more particularly at littoral sites in the Landes, and at Ségor in the Charente-Inférieure.[2]

(D) THE EARLY NEOLITHIC INDUSTRY OF BALLANTRAE, AYRSHIRE

(i) The existence in south-west Scotland of a facies other than Larnian directly associated with the Early Post-Glacial raised beach was not suspected until the Edgar Collection of stone artifacts from Ballantrae in Ayrshire was closely studied.[3] Inspection of the relic-yielding terrain between Ballantrae Bridge and Downan Point, and the scrutiny of sections in the raised beach formation on the south or left bank of the River Stinchar (Pl. IV *b*), confirmed that a derived Larnian industry could be stratigraphically separated from one which was later and more prolific (above, p. 150).

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[1] Coulonges, 1935, pp. 25–32.

[2] Octobon, 1932.

[3] Lacaille, 1945.

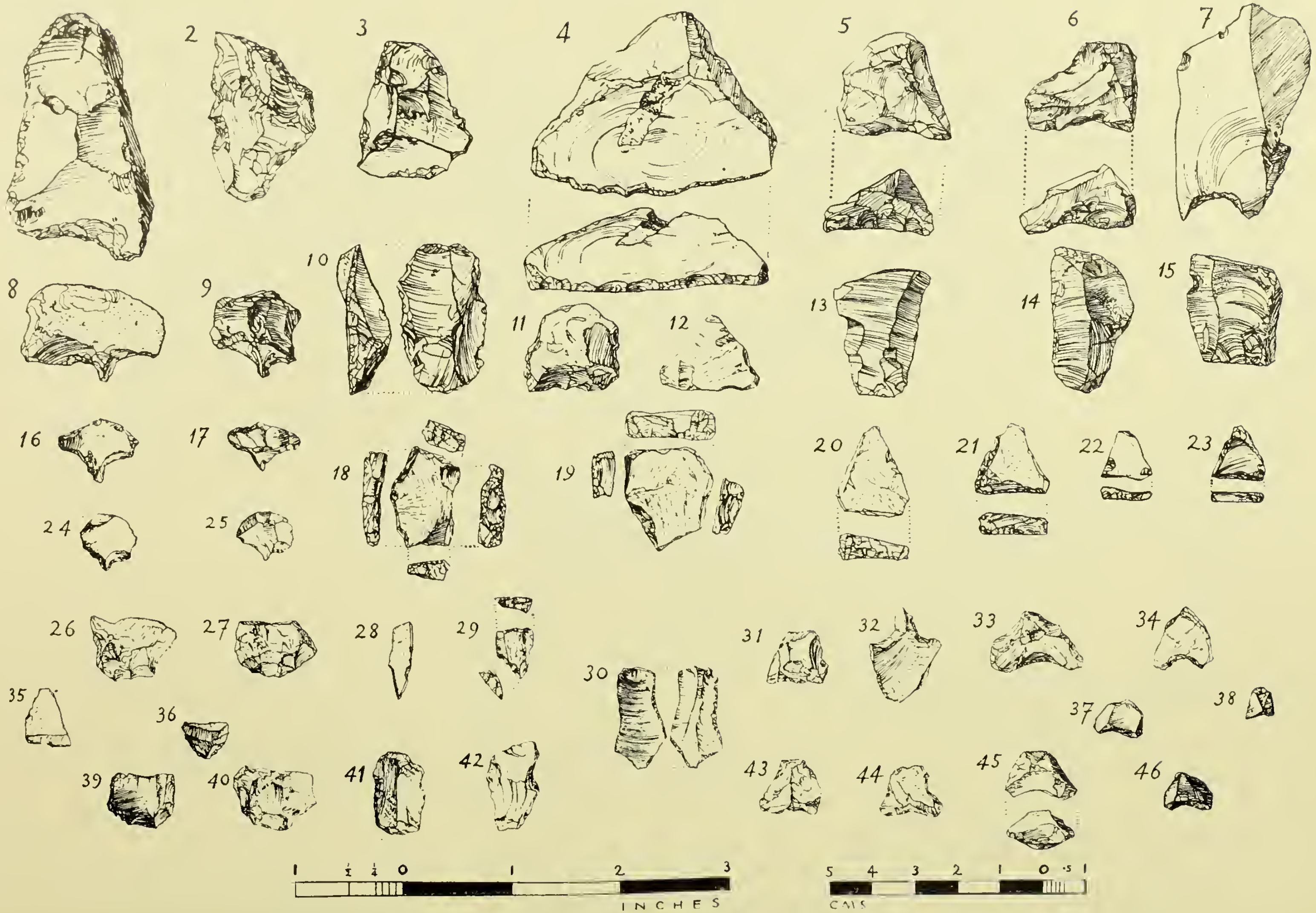

FIG. 113. Flint industry from the lower slopes of the Castlereagh Hills, Co. Down. (After Whelan, 1938.)

The order here is in fact analogous with that noted at Rough Island in Strangford Lough, Co. Down,[1] for the beach gravel at the Irish and Scottish sites yields Early Larnian material, and the humus directly overlying it contains distinctive early post-Mesolithic artifacts, scores of which have been turned up by deep ploughing. As in north-east Ireland, the industry from the humus in the Stinchar estuary is *in situ*. It indicates the introduction, if not of a new culture, at any rate of many new cultural elements, into south-western Scotland about the time when, towards the beginning of the Sub-Boreal climatic phase (end of the third millennium B.C.) the emergence was almost completed. The rise of an epimesolithic or Early Neolithic industry on the Carrick shores, similar to that developed in north-east Ireland, coincided, therefore, with a phase of the Mesolithic Obanian culture in Argyll.

(ii) Sharpness of edge characterizes the Ballantrae specimens, which can be compared with the Irish coastal Early Neolithic. Although many are quite unaltered of surface, some nevertheless look as if they were bleached white, or bear a greyish patination, or a bluish-white incipient change. A few are ochreous, and several are stained as if with rust. These surface alterations are not, of course, sure guides to age. Yet it is a striking fact that all the forms of the later facies contrast with those of the Ballantrae Early Larnian, which are deeply weathered in a chalky-white patina and dulled on the ridges and edges. Owing to the better preservation of the archaeological contents of the humus, much of the flint represented is seen to be of the same high grade as that used in the littoral industries of north-east Ireland. There is evidence from other sites on the shores of south-west Scotland which suggests that flint was imported from Antrim.[2] It may be, therefore, that man brought some across the North Channel to Ballantrae. On the other hand, flint nodules occur in drifts at Ballantrae and along the coast southward as far as Loch Ryan. These would have been dredged and carried by ice from the Cretaceous beds on the sea-floor between Arran and the Rhinns of Galloway.[3] It is a question, therefore, if one is always justified in thinking of imported flint in this part of Scotland when it seems more reasonable to suppose that locally obtained material was used. Indeed, a flint supply at Ballantrae would in itself be an attraction to bands seeking a place to settle. Arran pitchstone is represented here by a few specimens, but the native chert seems to have found little favour. There occur struck quartzes and a few chalcedony artifacts. The small size of the raw material is reflected in that of the implements; compared with the Irish, the Scottish are smaller.

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[1] Movius, 1940 (*b*).

[2] Breuil, 1922, p. 265; Scottish Exhibition Catalogue, 1911, entries 19, 20, and 21, p. 813; McCallien and Lacaille, 1941, pp. 60–61.

[3] Charlesworth, 1926 (*a*), pp. 8–9.

The Early Neolithic industry of Ballantrae, like that of north-east Ireland, differs from the Larnian in the condition of its products and in the presence of its many retouched forms. It includes some simple types surviving from the older facies, besides forms which are characteristic of the correlative culture of the Ulster coast. In one important aspect, still to be discussed, the industry from the Carrick shores contrasts markedly with its Irish equivalents. On this account, and because the site has furnished the type-forms by which the facies is known to have reached Scotland, the industry must be examined here in some detail (Figs. 114, 115, and also Fig. 116).

At Ballantrae the early post-Mesolithic settlers produced and used thicker flakes, blades, and pieces than their Larnian forerunners. Nos. 1 and 2 exemplify plain, nos. 3, 4, and 5 utilized, flakes and blades. Of those retouched, as nos. 6–8, most have been trimmed from the bulbar face, but in a few the dressing has been executed from the upper, as in no. 28.

Tanged points. Many flakes are thinned and narrowed by edge-trimming at the bulbar end to an asymmetrical tang (e.g. nos. 9–11). In several this working involves the basal edge of the upper surface and the lateral margins at the lower end (as in nos. 12–14). The most attractive examples are perfectly leaf-shaped (e.g. no. 13), having evidently been selected on the core, after removal from which they were dressed along the butt near the tip.

All these fall into the same category as the classic points of the Bann River culture (p. 251), the prototypes of which are seen in the Larnian industries on the Irish and Scottish sides of the North Channel (pp. 135–6, 151). The series figured here (nos. 9–14) is significant as the first from the mainland of Great Britain which compares with a group of the type-form of the Bann River industry. No. 14 provides a close parallel to a product of the Early Neolithic industry of Rough Island.[1] Too thick at its crusted and rounded end to serve as a weapon-point, it is probably a scraper meant to

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[1] Movius, 1940(*b*), p. 131, and Fig. 7, no. 62.

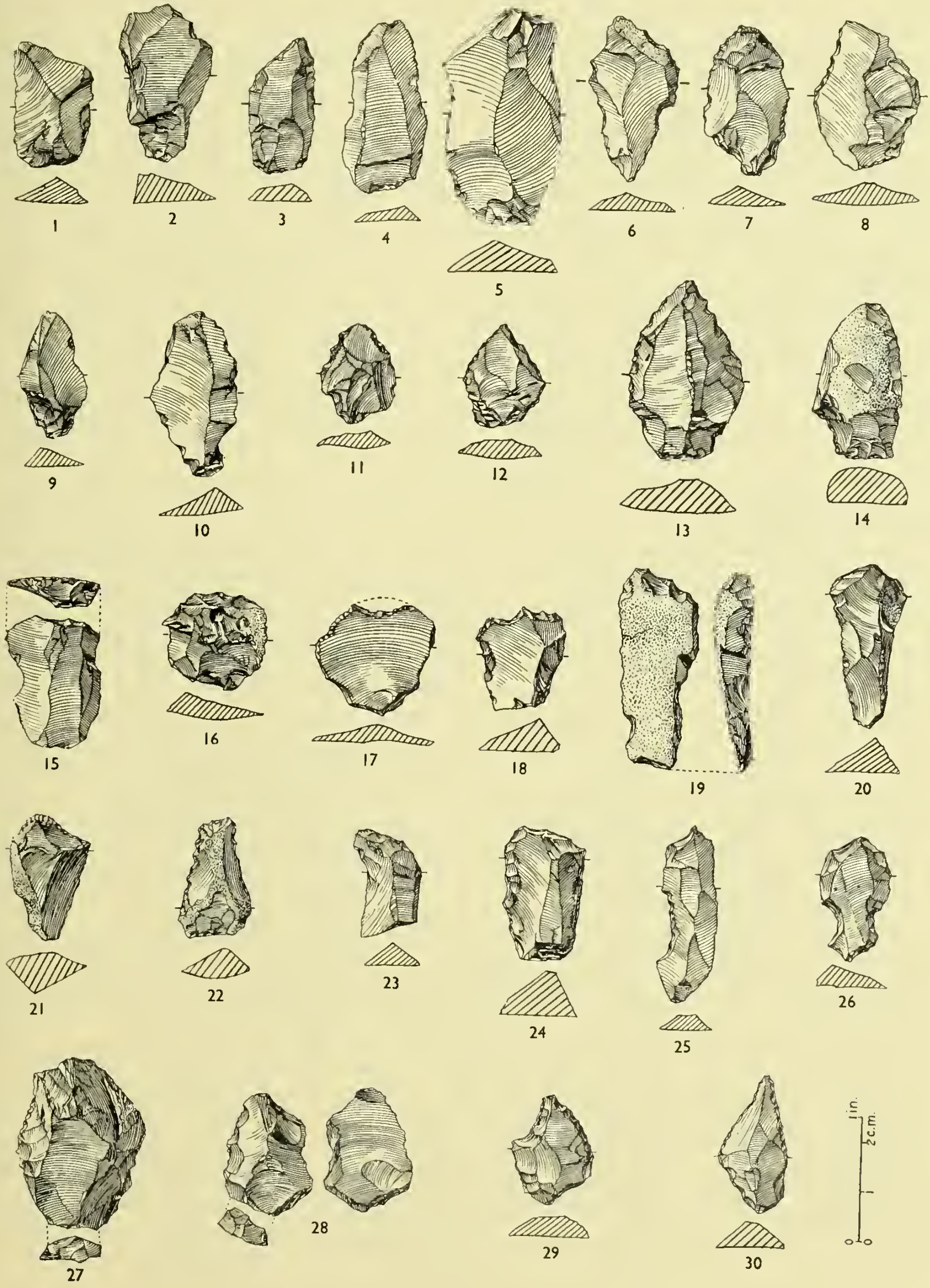

FIG. 114. Early Neolithic flints from Ballantrae, Ayrshire. (Nos. 1–30.)

be fixed into a haft. None of these Scottish objects is, however, quite so developed as the Irish artifacts. It is probable that, with the accompanying allied forms, they belong to an industry earlier than the full Bann River culture with its arrow-heads, pottery, and ground axes. In the British Isles, outside Ireland, implements of this kind were, until recently, only known in the Isle of Man.[1] Therefore it is interesting to note that poor examples, not more advanced, however, than coastal Mesolithic prototypes, have been recognized far inland at Woodend Loch, Lanarkshire (e.g. Fig. 75, no. 7).

Scrapers. The resemblance between the Irish and Scottish industries from the humus topping the Early Post-Glacial raised beach is enhanced by the absence of end-scrapers on parallel-sided blades and by the frequency of tools made on thick, short flakes (e.g. nos. 15–18). Steep and nosed examples present in the Ballantrae group (nos. 19–21) are similar to specimens from stations in Ulster. No. 22 is singled out for its exceptional tapering, and because it has been fashioned in the trimming from a nodule bearing the deeply patinated scars of earlier knapping.

True side-scrapers are uncommon, but there occur a few thick counterparts of implements from the Irish equivalent deposits. A light form (no. 23) is dressed along the convex right edge. Variants, combining the long working-edge with another, are well represented (e.g. no. 24, made on a core-trimming).

Deeply notched flakes, probably concave side-scrapers (as nos. 25 and 26), resemble Irish specimens. No. 26 exactly matches one in the Early Neolithic series from Glenarm.[2]

Flakes with faceted butts. Another link with the industry from the overburden of the raised beach in Ulster is provided by rather thick flakes (e.g. nos. 27 and 28) with faceted butts indicating preparation of the striking-platform on the core in the Levalloisian manner.

Perforators. Tools for piercing and reaming, which are but poorly represented in the assemblage from the humus at Ballantrae (nos. 29 and 30), preserve the typology of the Larnian.

Picks. Survivals from the coastal Mesolithic industries occur in the shape of 'Larne picks' (e.g. nos. 31 and 32). These are more extensively retouched than any known Scottish Larnian specimen. The drawings show how these

[1] Clark, 1935 (*b*), pp. 74–75.

[2] Movius, 1937, p. 200, and Fig. 7, no. 40.

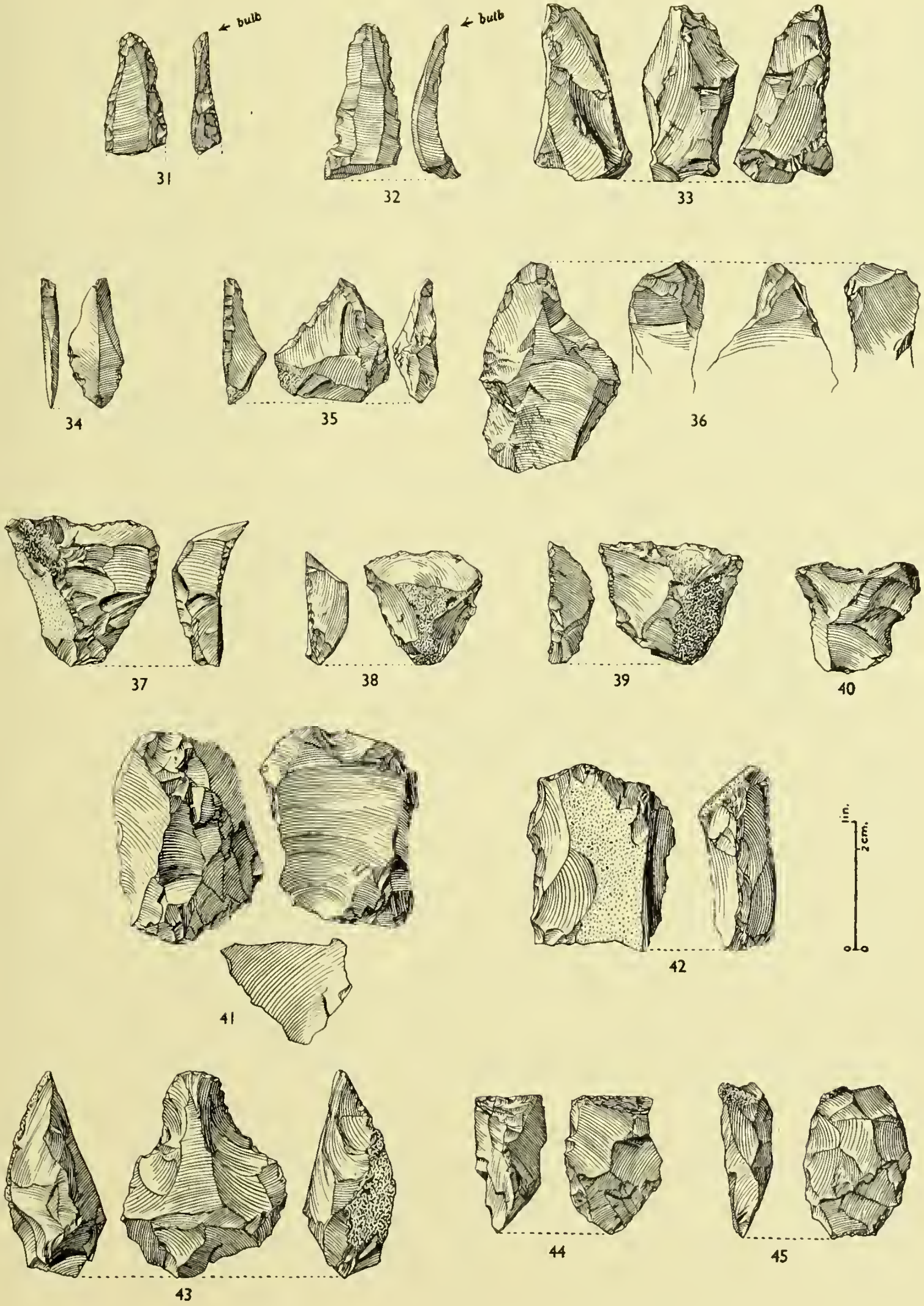

Fig. 115. Early Neolithic flints from Ballantrae, Ayrshire. (Nos. 31–45.)

differ from another pick (no. 33), which is the counterpart of an Early Neolithic example from Glenarm,[1] also made in a core-trimming.

Gravers. As in series from Irish coastal stations, a few ordinary (*bec-de-flûte*) gravers (e.g. no. 34) occupy a place in the equivalent suite from the estuary of the Stinchar. No. 35, an angle-graver, appears to have been made on a discarded, or miss-hit, *tranchet.* A thick spurred flake served for no. 36, which recalls an Aurignacian *burin busqué.* As in a flat graver (*burin plan*), the nether surface of the beak bears fine facets intersecting with facets on the vertical edge. The right margin is blunted, presumably to prevent injury to the user's finger and to allow of the application of greater pressure. This thick graver may represent an association with the industry of Castlereagh Hills, with its similar rather heavy tools which have affinities with the Late Tardenoisian (Neolithic) of south-western France.[2] If so, the presence of this object would suggest that the Early Neolithic facies of Ballantrae lasted a long time and received strengthening elements.

Tranchets and derivatives. Among the early post-Mesolithic introductions into Carrick, which served to bind more closely the coastal cultures of the Irish and Scottish shores of the North Channel, there are included *tranchets* and cognate flake-implements. The specimens from Ballantrae are smaller than most Irish examples, and therefore may be regarded more properly as chisels than flake-axes. Of those figured, no. 37 is still sharp, but no. 38 is slightly chipped from use.

Variants appear in the form of 'fish-tail' scrapers, no. 39 having a straight, and no. 40 a concave, edge.

Cores and core-tools. The residual cores of the later Ballantrae series are more varied than the Larnian. Many with deep scars and pits of percussion reflect the thick material removed from them. A Levalloisian aspect is imparted to some (e.g. no. 41) by the facets on the lower rim and base, which resulted from the preparation of a striking-platform. This is confirmed by the flakes detached from such cores, here and in north-east Ireland.

Technically the thick scraper (no. 42) is as much a core-tool as the implement (no. 43) flaked in an oval pebble. This (no. 43) may be compared with the diverse post-Mesolithic thick tools with concave working-edge, including the Y-shaped objects from the humus overlying the Early Post-Glacial raised beach in Ulster. As such it can also be linked with the heavier artifacts from the Castlereagh Hills station,[1] a site which has yielded so many specimens resembling the Late Tardenoisian macrolithic products of south-western France.

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[1] Movius, 1937, p. 202, and Fig. 8, no. 51.

[2] Whelan, 1938, pp. 133–5, and Fig. 10.

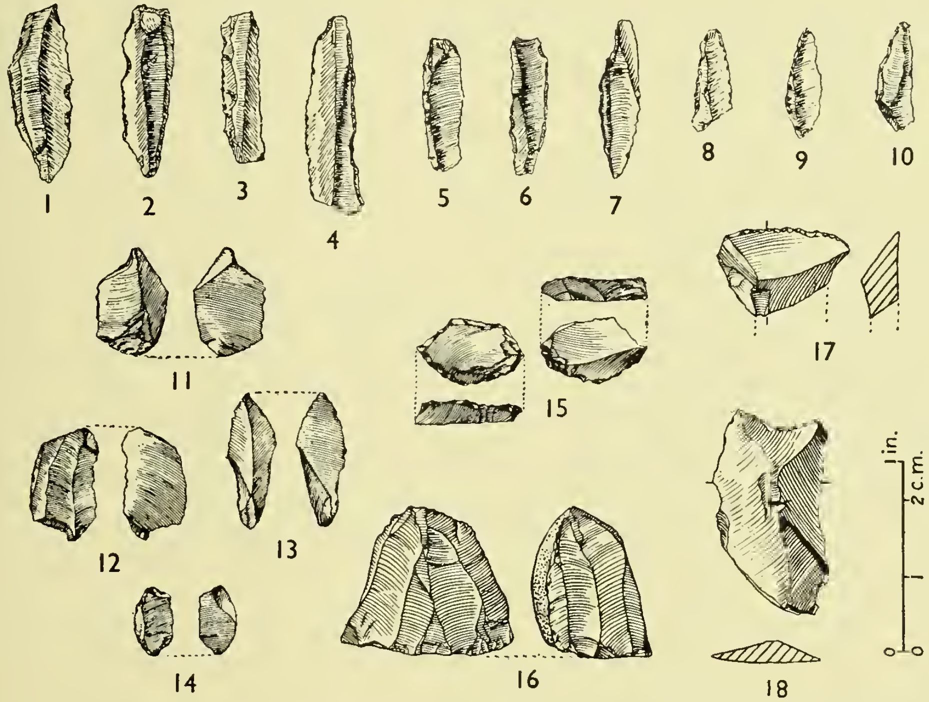

FIG. 116. Microliths from Ballantrae, Ayrshire. (Nos. 1–10 after Edgar, 1939.)

The celt-like objects (nos. 44 and 45) with *tranchet* bezels serve to strengthen the identity of the Early Neolithic strand-loopers' industries in Carrick and in Ulster.

The microlithic element. In one respect the industry recovered from the humus capping the raised beach at Ballantrae is more comprehensive than its Irish equivalent. For example, its output includes a considerable element of narrow-bladed microliths of Tardenoisian types,[2] such as have not so far been found in Ireland. These forms are quite distinct from the abruptly edge-worked, small implements of Upper Palaeolithic aspect, which are referable to the local Early Larnian industry (p. 151, and Fig. 55, no. 6), and in which the specialized technique cannot be shown to have had a place. Yet, as already discussed (p. 144 and pp. 153–4), knowledge of

[1] Ibid.

[2] Edgar, 1939.

it must have been carried from the south-eastern part of the country into Carrick and Kintyre about the same time early in the Atlantic climatic phase. Its practice in the post-Mesolithic industry is proved at Ballantrae by many non-geometric and geometric microliths made in the Tardenoisian tradition (Fig. 116, e.g. nos. 1–10), by all types of micro-burins, butt-end, tip, and notchless (nos. 11–14), and also by hollowed small blades prepared for division. There occur, too, blades cut above the bulb of percussion by a process allied to micro-burin technique[1] and the waste resulting from this process (no. 15). Characteristic small, shallow-scarred pyramidal cores, from which the narrow blades were drawn for the manufacture of microliths, are common (e.g. no. 16).

It is interesting to notice that in two implements which are typical of the Early Neolithic industry the characteristic *tranchet* edge has been trimmed by delicate abrupt retouch. The specimens are 'fish-tail' scrapers, one (Fig. 116, no. 17) having a slightly convex edge, and its companion (no. 18) a pronouncedly concave edge. The latter can be distinguished from the minutely dressed Irish late (i.e. Bronze Age) concave scrapers or spokeshaves; these advanced tools grew probably from such Early Larnian prototypes as those found in the series from Albyn Distillery, Campbeltown.[2]

2. DISTRIBUTION OF THE EARLY NEOLITHIC FACIES IN SOUTH-WEST SCOTLAND

(i) So well represented is the Early Neolithic facies at Ballantrae that we may assume it was fairly distributed on the south-western seaboard. But unfortunately there is little as yet to support this assumption, which can be substantiated only by exposure in sections. Isolated specimens suggest, however, that the influences of this coastal culture reached the region farther south, most probably from Ireland. It then spread beyond Carrick and appears to have endured locally.

In the collections of flint implements from the Sands of Luce, Wigtownshire, which are preserved in the National Museum of Antiquities at Edinburgh, there are specimens which bear a close resemblance to artifacts from the humus on top of the raised beach at Ballantrae. There is no record of the exact conditions in which they were found. Still, our knowledge of this wide expanse, rich in relics, warrants the assumption that they come from an old land-surface which had been exposed by winds at the base of sand-dunes laid down on the Early Post-Glacial raised beach.

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[1] Vignard, 1931, pp. 92–103; Lacaille, 1944, p. 10.

[2] McCallien and Lacaille, 1941, pp. 75–76.

(ii) So far there is no proof that any bands of food-gatherers moved inland from the coast in south-west Scotland under the pressure of colonists possessing a more advanced culture than that of Early Neolithic, such as is represented at Ballantrae. Only the Woodend Loch industry shows possible signs of contacts between the seaboard and the interior (above, pp. 189–93).

3. THE TOMB-BUILDERS AND THE BEAKER FOLK

(i) It seems probable that the Early Neolithic innovations were implanted in south-west Scotland before the first waves of Megalithic people arrived on the coasts and islands round the Firths of Solway and Clyde. Some detachments of these advanced invaders then penetrated into the interior towards the basins of Tweed and Tay, and spread coastwise to the southern shores of the Moray Firth. The principal stream, however, made north by the Atlantic route, touched the west coast at a few points, reached the Hebrides and Skye, and carried on to the Orkneys and Caithness. Meanwhile other colonists possessing a different culture, which had been developed in the Rhineland, descended on the shores of the North Sea. Thus two main distinct races settled in Scotland during the Sub-Boreal climatic phase. Our knowledge of them is derived mostly from graves. One race was dolichocephalic and buried its dead in collective tombs; the other was brachycephalic and practised individual burial. The tombs of the dolichocephalic race were furnished with characteristic round-based pottery; and distinctive Beaker ware is found in the individual graves of the brachycephalic people. Stone implements have been recovered from both types of graves, and bronze objects sometimes from the later individual burials. Similar relics are recorded from contemporary domestic sites. Although not always separable in point of age, the collective tombs have commonly been referred to the Neolithic, and the individual sepultures to the Bronze Age.

(ii) It is not proposed to consider all the results of these invasions which culminated in the full Bronze Age colonization of Scotland. We shall deal only with those aspects which bear on the present study. These two cultures of food-producers which derived from different sources may long have coexisted independently on both sides of the country before they eventually came into contact at many places. During all this period immigrant waves continued to reach these shores. Of more nomadic habit than the tomb-builders, the Beaker folk and their successors, some of whom cremated their dead and manufactured specialized types of funerary vessels, penetrated inland by the valleys, and in time gained the western and northern islands. Particularly on the Atlantic seaboard, domestic remains, burials, and stone-settings indicate an extension of the movements of more advanced Early Bronze Age people from the south along the coasts of the Irish Sea.

The Megalithic invaders brought the same new methods of working stone into Scotland as they did into Ireland. These techniques included grinding and flat trimming, as is shown by axes and some common tools and weapon-points, notably the simpler forms of lozenge- and leaf-shaped arrow-heads. They introduced, among other forms, the lop-sided arrow-head derived from the *tranchet* which was possibly cognate with the Continental Late Tardenoisian trapeze (p. 122). They probably also introduced tool-forms of the kinds which on the Castlereagh Hills, Co. Down, suggest a connexion with the debased Tardenoisian element in the Early Neolithic of south-western France.

The Beaker and the more advanced Bronze Age folk practised that matchless technique which produced so many exquisite flint artifacts, including arrow-heads best expressed in the barbed-and-tanged variety, knives, and various scrapers. Axes and other implements they ground to a high polish, and sometimes applied the process of grinding to flaked and pressure-worked tools. Their skill in working stone seems to have attained its peak simultaneously with the development of the flat axe and other bronze implements, weapons, and ornaments.

4. CONTACTS

While it would appear that by Sub-Boreal times several distinct societies of food-gatherers were distributed in Scotland, this population, though widely scattered, must have been very small. Whereas in many parts of the country the relics of its poor industries furnish the earliest evidences of man, in others the remains of the food-producers provide the first signs of colonization. Some of these people of mature and developed traditions settled near the primitive communities, who continued to practise Palaeolithic economy and ancient technical methods. It is certain that these small ill-equipped bands, who squatted on the sea-shore, dwelt in the mouths of caves and in rock-shelters, or camped on the banks of rivers and lochs, could have offered no effectual resistance to the new-comers. Some members of the food-gathering population must have joined the more advanced colonists, but in many localities, especially along the coasts, the original inhabitants preserved their independence, but profited from meeting the immigrants and copied some of their ways and crafts.

Much work has to be done before the effects of these contacts can be fairly estimated. What has so far been learned, mainly from discoveries of the Bronze Age complex on the Atlantic seaboard, shows variations even within limited areas. In the North Sea basin unambiguous records of Mesolithic coastal settlement are few and the evidence is therefore difficult to assess (see pp. 175–8, 184–5). Nevertheless, it is from the northern part of this territory, rather than from the western side of the country, that we see the impact upon a strand-loopers' economy of another which, though less developed than that of the full Bronze Age, is yet more advanced than that of the stone industry from the humus overlying the Early Post-Glacial raised beach at Ballantrae. These facts are reminiscent of the infinitely older association in Northern Ireland between, on the one hand, the products of Neolithic stone-working techniques and pottery, and on the other, the later industries from the humus topping the Early Post-Glacial raised beach. They are also reminiscent of comparable associations on Rathlin Island and in the Bann River valley (above, pp. 249–53).

5. THE NORTH SEA BASIN

(A) THE COAST OF SUTHERLAND

Over eighty years ago primitive coastal settlements between Golspie and Dornoch in Sutherland were described.[1] Near the Meikle and Little Ferries many shell-mounds were observed about 20 feet from the shore. They were from 20 to 100 feet in diameter, heavily capped with grass-covered sand, and seldom more than 30 inches thick.[2] From sections exposed artifacts of flint, quartz, and other stone were taken, and these are now preserved in the National Museum of Antiquities at Edinburgh.[3] They are atypical and belong to a poor industry of utilized flakes and pieces with few crudely retouched forms. The situation of the refuse, which was composed of the shells of the ordinary food molluscs and the bones of wild animals, suggests an equivalent of the culture of the western Obanian strand-loopers. It was therefore probably an outcome of the culture represented by the industry from the raised beach at the Stannergate and at Broughty Ferry on the Firth of Tay (pp. 175–8). A well-made faceted flint implement, described as a spear-head, from one of these shell-heaps may point to contact with the cairn-builders. In the same district, between Dornoch and Embo, the remains of food-collectors were noticed at 10 to 30 feet above high-water mark.[1] These people seem to have been more advanced, or to have profited in other ways from meeting the possessors of a more developed culture, since their middens adjoin the ruins of small hut-circles.

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[1] L. Tait, 1868, pp. 525–7.

[2] Idem, 1870, pp. 63–64.

[3] Scottish National Museum Cat., 1892, HR 1–14, p. 250.

(B) FRESWICK BAY, CAITHNESS

Archaeologists are familiar with the reports on the mounds which at Keiss, Caithness, concealed stone-built dwellings with their abundant relics of occupation and industry. Not so well known is the fact that one of these massive structures had been erected upon an ancient shell-midden.[2] This contained a crude industry of quartz, flint, and other stones, with simply-worked splinters of bone and poor pottery. The stone industry was not unlike that from the refuse-heaps near Dornoch, and in many of its products similar to that found in the building above at Keiss. Two-period occupation is just as interestingly illustrated by the site of the food-gatherers' encampment which was recently explored at Freswick Bay in the same county, and which was found separated geologically from an underlying flint industry of Mesolithic facies in the upper part of the ill-developed Early Post-Glacial raised beach (above, pp. 184–5). These Freswick remains are very similar to those recorded from the overbuilt shell-midden at Keiss. Thus they indicate a primitive economy coupled with some marked progress, probably due to the contacts of peoples. It was therefore in advance of the standard represented by the flints from the underlying bed. From an aggregate of molluscan shells, remains of large red deer, birds, and fishes, there has been recovered an industry in the fairly common drift-borne brown and grey flint of the region. Other relics yielded by this deposit are worked antler and bone, an artificially perforated shell of *Turritella* (Fig. 117, no. 14), and also a small quantity of potsherds.

The stone industry is not unlike a Late Larnian. It consists of coarse flakes and some blades, many exhibiting signs of considerable use (Fig.

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[1] L. Tait, 1868, p. 527.

[2] Laing and Huxley, 1866, pp. 20–22.

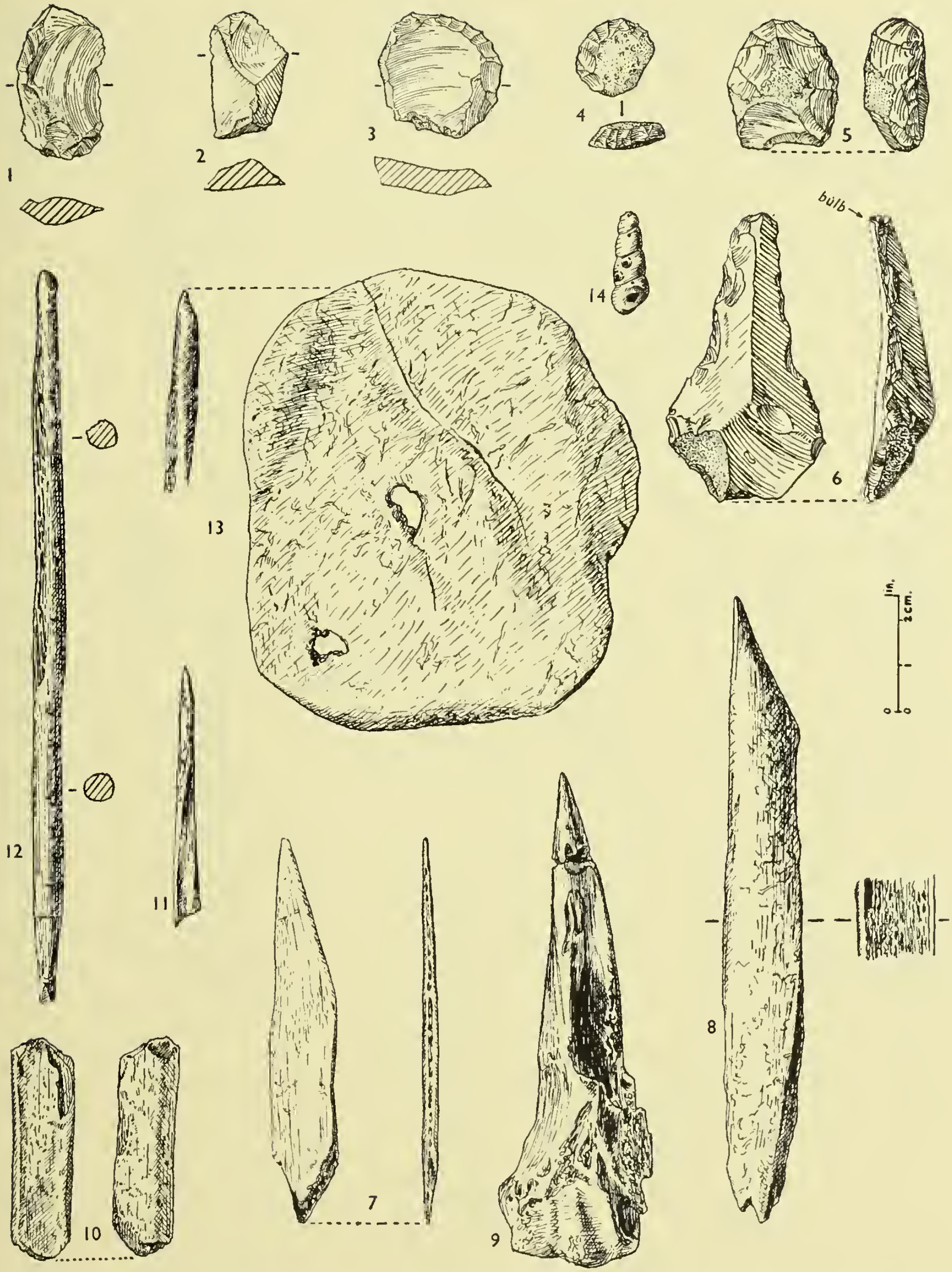
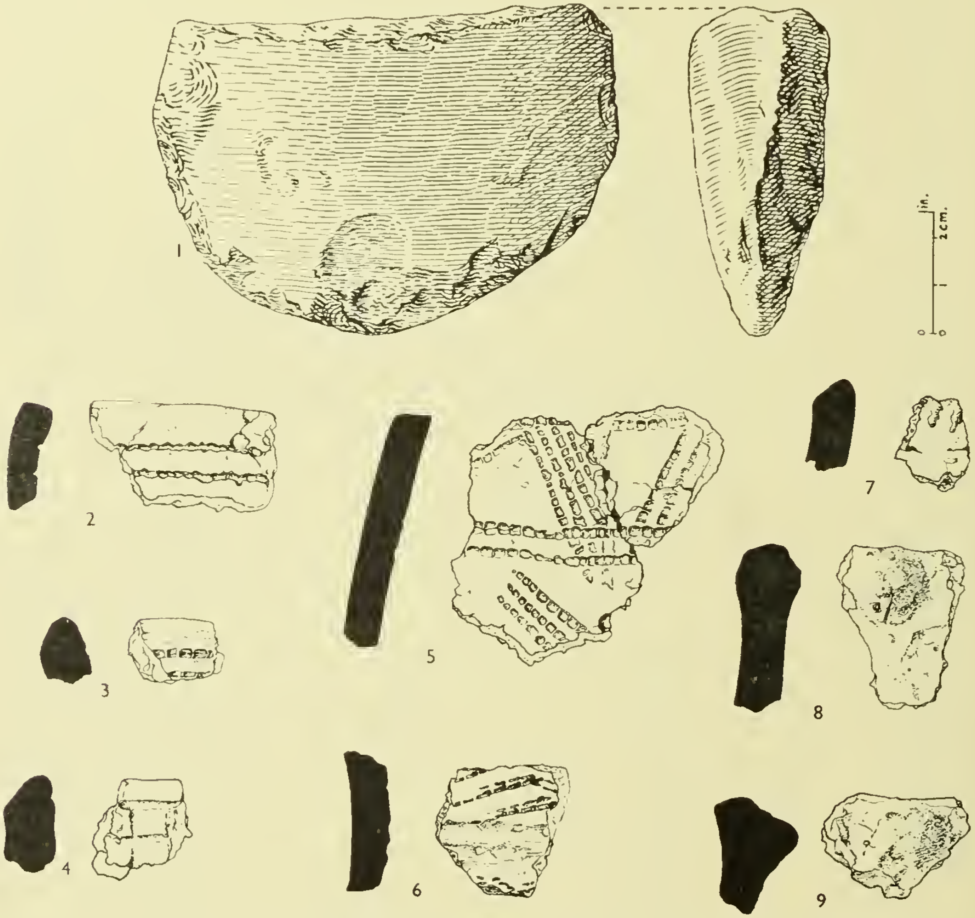


FIG. 117. Implements of flint, bone, and red deer antler, and a perforated shell, from occupation-refuse at Freswick Bay, Caithness.

117, nos. 1 and 2), besides a few retouched and much-worn scrapers (nos. 3–5). These relics are unpatinated, but otherwise similar to the series from the horizon beneath (Fig. 72). Split cobbles are common, many being much edge-worn from use as choppers (e.g. Fig. 118, no. 1); and there also occur rude slate pot-lids.



Fig, 118. A stone tool and potsherds from occupation-refuse at Freswick Bay, Caithness.

The recent local find of a large plunging flake of honey flint (Fig. 117, no. 6) is interesting. Quite unaltered of surface, but trimmed slightly and considerably worn at the narrow bulbar end, it is exactly like a Larne pick. This most northerly example is noteworthy; it shows the wide distribution of a type long thought restricted to the classic region of the North Channel.

Many pieces of antler and bone are cut and marked by stone tools. Rubbing on stone also accounts for the shaping of several to round or bevelled ends, and to flat, smooth surfaces and sharp points (Fig. 117, nos. 7–13). These include short pieces (e.g. no. 10, antler), exactly like those which are common in Obanian deposits, and several piercers, one being adapted by rubbing down a branchiostegal ray of a large fish, probably a cod (no. 11). A remarkable item is a plain point of circular section, like a spindle, 16 cm. long and 6 mm. thick (no. 12), made in antler and tapered at the base for insertion into a holder. Another shapely piece (no. 13), drilled through in two places, has been cut and rubbed regularly to symmetrical shape out of the shoulder-blade of an ungulate, which, from the thinness of the bone, was probably a deer. The lower part of the internal edge, particularly at one corner, is polished from use, possibly as a skin-scraper. The object may be compared to the Eskimo *ulu*(*k*) or 'woman's knife'.[1]

The potsherds, which are bits of beakers or of some allied ware,[2] include: (*a*) a rim from a 'cord-ornamented' vessel (Fig. 118, no 2); (*b*) a rim decorated with a hyphenated line (no. 3); (*c*) a slightly bevelled rim with shallow grooving (no. 4); (*d*) fragments with warm brown surface bearing hyphenated lines (no. 5), in one case supplemented with a shallow tooling (no. 6); (*e*) pieces of softer black ware adorned with hyphenated lines; (*f*) minute sherds of black ware with internal bevelling (no. 7); (*g*) fragments coated with a thick slip and decorated with small knobs (nos. 8 and 9).

This pottery corresponds to that of Bronze Age character from the upper levels of the herdsmen's habitations at the classic Orcadian sites of Skara Brae and Rinyo (Rousay). That the economy represented at Freswick Bay was, however, on a much lower plane than that of the islanders is shown by the crude equipment and by the entire absence of remains of domestic animals. Evidence of comparable developments on Mesolithic foundations could certainly be adduced from many other accumulations of occupation-refuse at open-air sites and in caves along the Scottish coasts. The upper deposits of certain caves at Oban (pp. 200 et seq.) are cases in point.

6. THE ORKNEYS AND SHETLANDS

(i) Whereas there are indications in Sutherland and Caithness that food-gathering communities gained something from food-producing colonists, it also appears that these more advanced food-producers assimilated and developed some Mesolithic implement forms. Thus, to contacts between these peoples are probably due the bone-work and some stone tools which illustrate the survival of early traditions at stone-built domestic sites. Among the most noteworthy are those explored on the mainland of Orkney at Skara Brae and at Jarlshof in the extreme south of the Shetlands. Skara Brae shows a Neolithic economy and Jarlshof a developed early metal culture. Yet in both regions, and not far from these wonderfully preserved stations, many stone tools of archaic aspect have been collected on the surface. The earliest cannot differ greatly in age from the relics recovered by the excavations within the structures themselves.

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[1] Cf. e.g. Lacaille, 1947, pp. 76–79.

[2] V. G. Childe, personal communication, 9-xi-1949.

Special interest attaches to the surface-finds from Orkney,[1] since in their variety they exemplify the blending of several ancient traditions in a remote and restricted area. Recognition of this is made easier in that most of the artifacts are of flint. Knives, edge-retouched flakes and blades (Fig. 119, nos. 1 and 2), the armatures of fishing-, fowling-, and hunting-gear in the shape of arrow-heads (nos. 3–5), small flakes and blades (nos. 6–11), all abruptly blunted, are reminiscent of decadent Upper Palaeolithic workmanship. Many resemble the late steeply dressed, flint flake- and blade-implements of north-east Ireland, which were manufactured in the old style but under intrusive influences (p. 253). However, considering the latitude of the finding-place and the fact that these Orcadian flints are less ancient, it is thought that they represent the utmost degradation of the battered back type, in the production of which micro-burin technique did not serve.[2] To these objects can be added small cores, also crude gravers, plain and angle types (nos. 12–14) made on these cores, exactly like those which on the western seaboard of Scotland bring to mind the debased Tardenoisian facies found in various Continental, English, and Irish stone industries. It is unlikely that any of these forms is a development peculiar to the Orkneys. They were more probably brought from the mainland where the blendings took place, for several crude, steep-backed flake- and blade-implements,[3] and some coarse gravers, have been detected in surface-assemblages in sandy areas along the coast from Dornoch northward.[4]

(ii) Small implements of the most distinctive kinds found in the Orkneys have not been reported from the Shetlands. Other remains, however, seem

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[1] Callander, 1930, p. 220; 1931; Randall, 1931.

[2] Lacaille, 1942, pp. 108 ff.

[3] Idem, 1935.

[4] Idem, 1938, pp. 187–8.

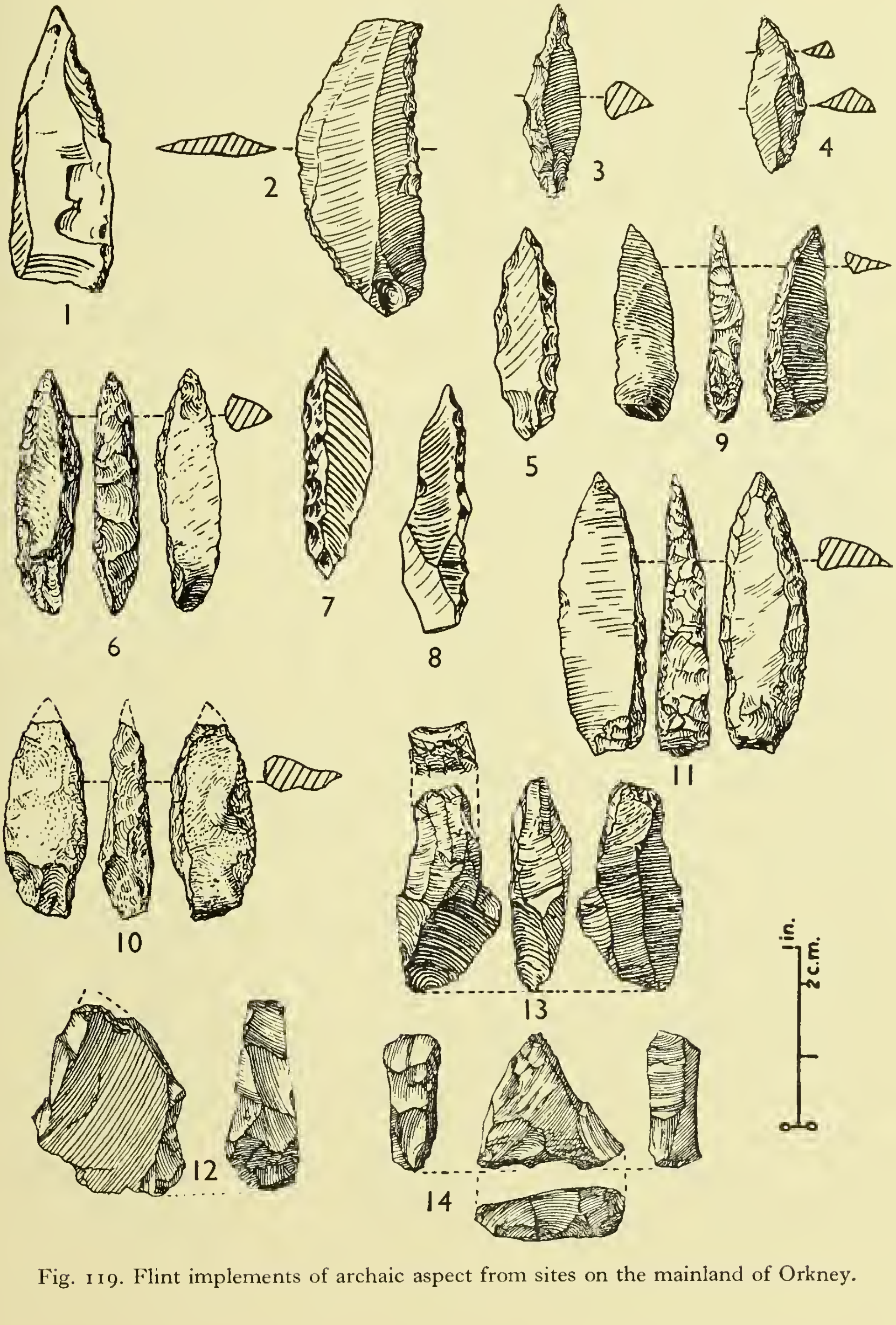

Fig. 119. Flint implements of archaic aspect from sites on the mainland of Orkney.

to link certain aspects of early settlement in the two archipelagos. But owing to their remoteness, the Shetlands must have been peopled relatively late in the Post-Glacial period, and then only by venturesome sailors, probably long after the first colonists had landed in the Orkneys.

We should therefore expect the earliest prehistoric stone artifacts of the Shetlands to be hybrids, atypical, and of decadent aspect. Such is the case in the smaller examples of flaking techniques. But the numerous relics found in the Shetlands present problems of their own, which perhaps involve more than their connexions with Scotland. For many of the stone implements picked up on the surface are of the categories which are found in ethnographic rather than in prehistoric collections. Among such are the polished knives of porphyry, to mention but one group which may also be represented in the west by a specimen from Oronsay. This cannot with certainty be assessed as Obanian.[1] Round self-handled clubs are common, but greatly outnumbered by heavy, unusually long and rudely flaked, sandstone and schist choppers. These are matched by many specimens from the Orkneys, notably at Skara Brae, on the mainland in Caithness, and by sporadic examples as far south as Wigtownshire. One authority assigns comparable Irish implements to a 'riverford culture',[2] another believes them to be introductions of the Megalithic people,[3] since objects of this order have been found stratified with artifacts of the Bann River culture of Ulster. Our northern tools were part of the equipment of inhabitants of a region abounding in seals and big fish, and where whales were frequently stranded. Leaving aside a few similar specimens from south of the Border, one recalls as possibly cognate some of the more massive, rudely worked implements from the Obanian shell-mounds on Oronsay (pp. 214–16, 228), and the weighty, club-like beach stones, untreated but probably selected, which were found in the occupation-refuse on Risga (p. 234).

Near Sumburgh Head, on the flanks of Ward Hill in Dunrossness, where, to judge from the numbers of specimens to be picked up, there flourished a club- and chopper-factory, smallish quartz flakes (e.g. Fig. 120, nos. 1–4), scrapers (nos. 5–8), and leaf-shaped arrow-heads (e.g. no. 9) have been collected.[4] With them, besides the ubiquitous sandstone, slate, and schist implements, there have been found hammer-stones, characteristic rubbers

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[1] S. Grieve, 1922, pp. 164–8.

[2] Mahr, 1937, pp. 283–331.

[3] Movius, 1942, p. 250.

[4] Lacaille, 1933.

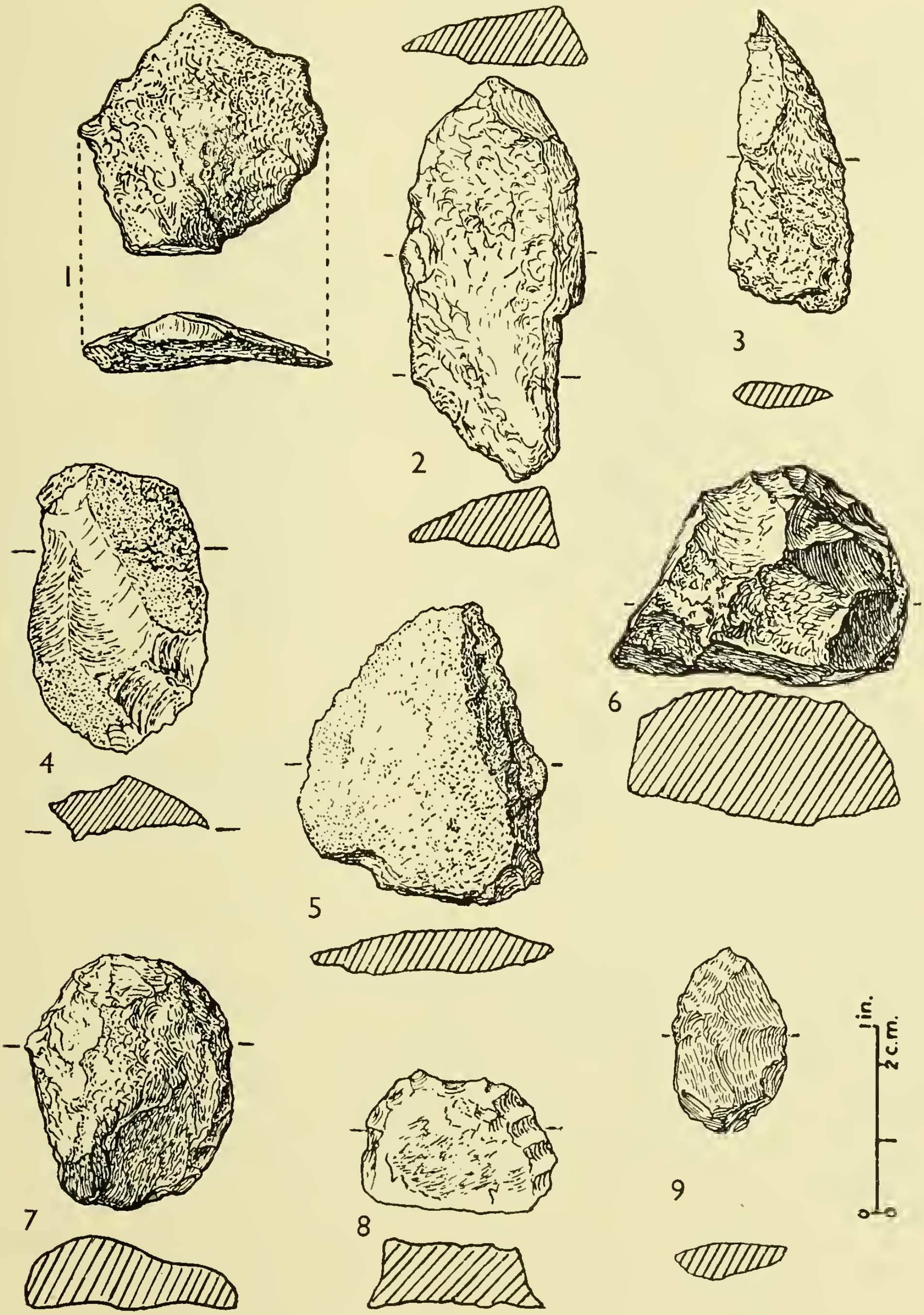

FIG. 120. Quartz artifacts from Quendale, Dunrossness, Shetland.

and worn saddle-querns near stone hut-circles, cairns, and hearths with the vestiges of shells and the weathered bones of fishes, birds, and animals. Such a combination certainly does not point to full Neolithic economy, but it illustrates yet another expression of lowly epimesolithic culture. This was not necessarily older than that represented two miles to the south in the earliest (that is, Bronze Age) level at Jarlshof.[1] Besides metal tools and arms manufactured on the spot, this township yielded stone implements identical with those from Ward Hill, also bone-work echoing the Baltic tradition.[2]

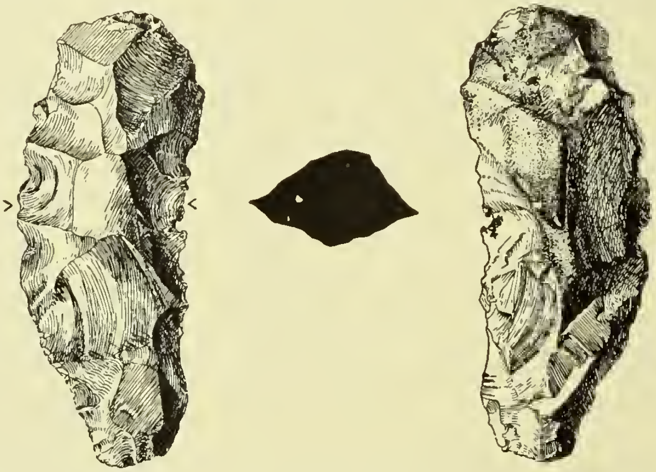

FIG. 121. Flaked flint axe from Fair Isle. (½) (After Cumming, 1946.)

Another significant tool in the Forest culture style of Sweden and Denmark has been recently reported from remote Fair Isle, between Sumburgh Head in Shetland and the northernmost of the Orkneys.[3] The object is a core-axe well-flaked in flint (Fig. 121), material that must be rare indeed on Fair Isle. It was found with pebbles in a patch of bare ground from which the peat had been eroded, about 300 feet above sea-level, west-northwest of North Haven. Without pollen evidence we cannot even guess the age of this truly interesting specimen. It may, however, some day be fitted into its place as one more link in an important chain.

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[1] Curle, 1933, 1934, 1935.

[2] Childe, 1946, p. 25.

[3] Cumming, 1946.

IX

MESOLITHIC SURVIVALS

1. THE SAND-DUNES

1. WHEREAS at some sites in the north various remains betray the impact of both Neolithic and later (i.e. Early Metal) ideas on a primitive economy, over a far wider area the relics of food-gatherers reflect more clearly the influences of metal culture only. This is particularly well seen in the expanses of sand-dunes along the coasts. Immense assemblages of antiquities from open-air encampments in such tracts enrich our museums and are evidence of the zeal of collectors; but unfortunately, precise records seldom accompany these series, which owe their discovery to the close scrutiny of patches bared by winds. Lately, however, more attention has been paid to the sand-dunes. Inspection has rarely revealed any stratigraphy, and it can only be said that as a rule the sand has accumulated from Sub-Boreal times onward. Locally it rests upon an old land-surface or peaty bed, believed to be of Late Atlantic age (p. 70), which caps the beach marking the transgression of the Early Post-Glacial sea. Since in some areas there occur alternating layers of midden, peat, and/or sterile sand, it may be possible, by further survey and piecing together of the evidence, to establish an approximate sequence which can be refined as our knowledge increases. The refuse of shells and bones, seldom more than a few inches thick, apparently indicates constant change of encampment or seasonal sojourns.

In the North Sea basin the principal expanses are: the Gullane Sands in East Lothian; the links on Largo Bay and the Tentsmuir Sands in Fife; Buddon Ness in Angus; the coastal strip from Aberdeen to Cruden Bay; the Culbin Sands in Moray; also stretches from the Dornoch Firth in Sutherland to Freswick in Caithness. On the Atlantic side of the country there are: the vast Sands of Luce (Glenluce), Wigtownshire; the sands at Shewalton (Pl. IX *a*), Ardeer, and Stevenston in Ayrshire; in Argyll the Machrihanish–Lange Links on the west coast of south Kintyre, and many bays in Ardnamurchan; and farther north in Morar, Inverness-shire (Pls. II *b* and IX *b*), and also in many of the Hebrides, Inner and Outer.

The most comprehensive collections from the sand-hills include stone artifacts, worked bone and antler, bronze objects, potsherds, and glass beads—even a few coins. Moreover, hearths, remains of hut-circles, and funerary deposits have been observed in these expanses. Such arrays cannot, of course, be assigned to any one stage of cultural development; like the smaller series from many caves, they commemorate settlements ranging over many centuries. Further, they demonstrate that in Scotland, as elsewhere in the British Isles in similar conditions, there long persisted a basically food-gathering economy which came under the influences of higher dominant cultures according to locality and time. Carrying down the traditions and habits of the Stone Age, which had been introduced into Scotland towards the end of the Boreal and beginning of the Atlantic climatic phase, the culture of the squatters in the sand-hills may as fittingly be embraced in the term epimesolithic as that of the 'Early Neolithic' folk, whose stone implements have been found in the humus overlying the Early Post-Glacial raised beach at Ballantrae and at some sites in north-east Ireland (Chapter VIII).

2. Formerly searchers were seldom attracted by any but the most obvious stone implements, and of these only the finest, manufactured in flint. This is well shown by the excess of trimmed forms to ordinary flakes and blades in collections. Of late years, however, an increasing knowledge of the characteristics of work in the less tractable stones is shown by the recovery of large groups of artifacts from sandy areas, in regions where the finer siliceous rocks do not occur. Stations unsuspected hitherto have thus been recognized, important additions have been made to existing collections, and new light has been shed on longshore primitive industries in Scotland. There is, nevertheless, something to be said for the assembling of such numbers of shapely flint implements, since collections from the sand-dunes can be taken as a whole, and the typology of their components more easily assessed. These are now seen to include many of the forms produced on the coastal grounds, and on the banks of rivers and lakes by Mesolithic and later colonists. The overwhelming majority, however, are objects fashioned by the admirable techniques, notably pressure-flaking, introduced by the Beaker folk, and brought to perfection in regions of isolation concurrently with the higher development of Bronze Age culture in other conditions.

Most sand-hill areas along the Scottish coasts provided an ideal environment for small unenterprising societies. Dry and sheltered camping-grounds, proximity to fresh water and to a usually rock-bound shore, a hinterland of heath and small woods, were their chief attractions for the strand-looper, fisherman, and hunter. Added incentive to settlement existed where these localities had a source of flint. Any lack of this would, however, be outweighed by the other advantages, and made up for by the best native substitute.

3. As the sand-dunes attracted food-gatherers, so did certain forest-free upland areas, particularly north of the Dee in Aberdeenshire. Generations of hunters were drawn to such localities by an ideal environment for the chase and by the unlimited supply of excellent Buchan flint (p. 179). Their flint weapon-points and everyday tools of well-developed Bronze Age facies, together with their habitation-sites, denote a marked advance on the simpler mode of life indicated by the microliths of the riverside folk around Banchory (pp. 178–84). Comparable archaic forms have not so far been recorded from the high grounds in the north-east, as they have from those of the Tweed basin and the eastern side of the Pennines. But sand-hill areas in Scotland, as on the Continent and in England, have yielded microliths, produced doubtless to arm hunting- and fishing-gear, and possibly to be the components of domestic tools. These small forms add to the knowledge obtained in the valleys of Tweed, Dee, and Clyde, and from the arable soil overlying the Early Post-Glacial raised beach at Ballantrae. Moreover, they show that, as in so many remote places outside Scotland, the microlithic facies persisted long into the Age of Metal.

2. MICROLITHIC INDUSTRIES

(A) THE SOUTH-EAST

On some floors in sand-hills microliths have been found in isolated clutches, on others mixed with relics of quite different character, mainly artifacts of Beaker type. Therefore, since these microlithic and later facies are believed to have first appeared in the south-eastern part of Scotland, series from the North Sea basin may be briefly reviewed before we deal with groups from the western shores.

It will be recalled that microlithic strains entered Scotland in the south-east and spread from that area. These strains descended from the Continental Early and Middle Tardenoisian, through the decadent Upper Palaeolithic facies of north-east England. It is regrettable, therefore, that little can be said of new collections from the mouth of the River Tyne in East Lothian, where, according to reports, Tardenoisian types have been picked up in the sand-hills; these are the nearest in Scotland to the Tweed valley with its prolific and long-enduring microlith-producing industries.[1] Further series of microliths of flint and chert, which are now in private ownership, were amassed between the two wars in the Gullane Sands, East Lothian, west of the mouth of the Tyne. These, together with arrow-heads, scrapers, and knives of Bronze Age facies made in the same materials, are important additions to the small record represented by a few specimens preserved in the National Museum of Antiquities.

(B) TENTSMUIR SANDS, FIFE

Sets of microliths from the Tentsmuir Sands are housed in the University Museum at St. Andrews and in the Public Museum at Dundee.[2] It is believed that they were recovered free from other forms among the sand-dunes, and in exactly the same circumstances as the potsherds, arrow-heads, scrapers, and other relics of Bronze Age type found in profusion among the Tentsmuir sand-dunes. The two groups, which do not differ in condition from the stone artifacts of more advanced aspect, seem to belong to the same industry. All the stone implements from the Tentsmuir Sands are manufactured in good materials, principally fawn-hued flint and some chalcedony, probably nodules from a boulder clay of the North Sea drifts.

Fine blades were the mainstay of the microlith manufacturers. Examples preserved in St. Andrews (Fig. 122), showing the passage from the plain blade (nos. 1–5), are characteristic of material worn from use or worked into implements. The commonest form is the point with obliquely trimmed edges; the upper edge in nos. 6–9, the lower in no. 10 with effacement of the bulb of percussion, both in no. 11, a lateral and a lower in no. 14. Microlithic edge-dressing appears also in objects which retain the bulb (nos. 12, 13, 15–17). The preparative cutting of blades by specialized Tardenoisian technique is shown in the points nos. 11 and 14, and in the micro-burin no. 19. The bulbar end of the material used for the point no. 9

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[1] In conversation with Dr. J. S. Richardson, formerly H.M. Inspector of Ancient Monuments, Scotland.

[2] Lacaille, 1944, pp. 5–11.

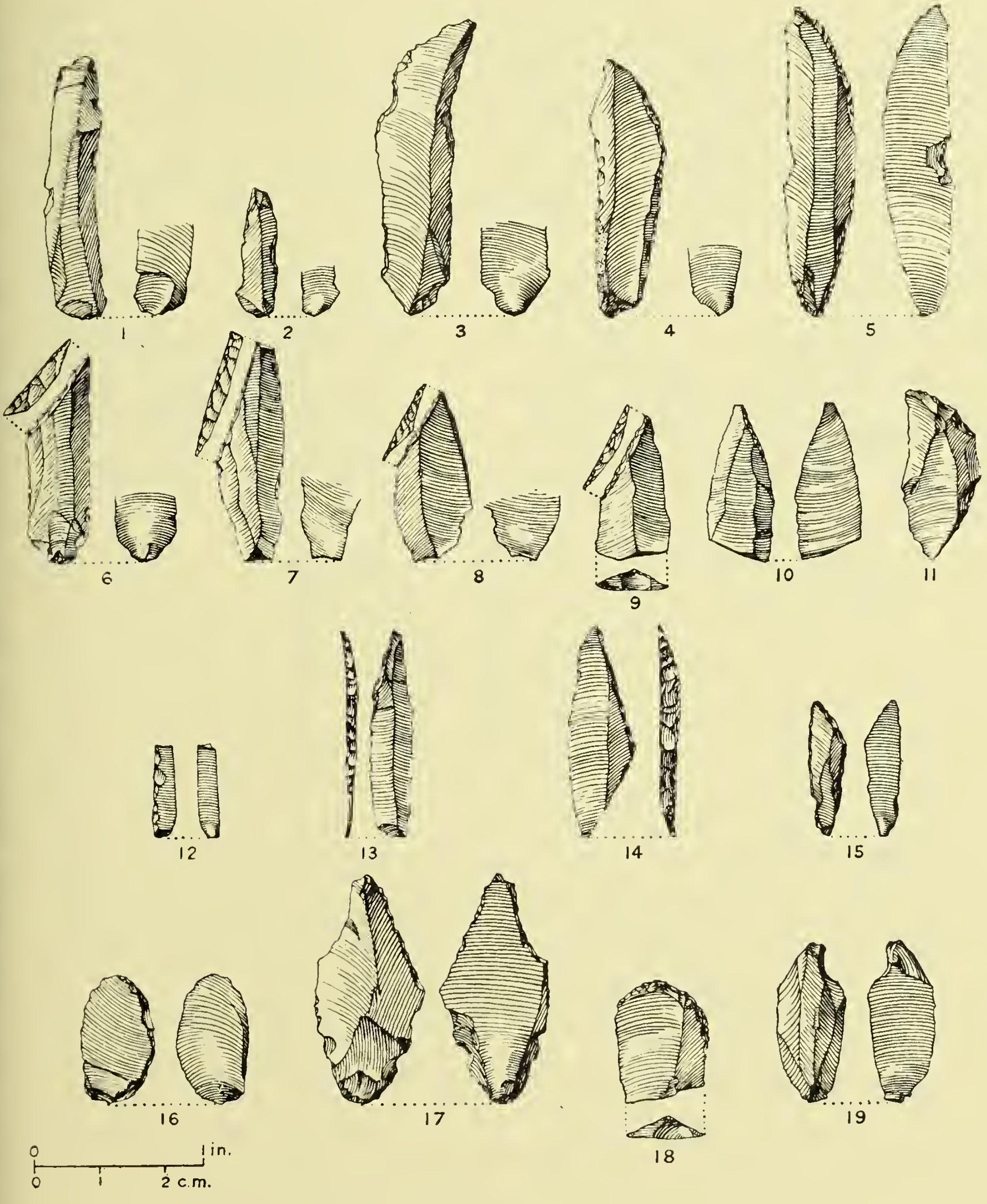

FIG. 122. Microlithic industry from Tentsmuir Sands, Fife.

and for the delicately edge-retouched scraper no. 18 was cut by the process thought to be cognate with micro-burin technique[1] already detected in the Early Neolithic series from Ballantrae (p. 262), and very like that followed today in the English gun-flint industry.[2]

The absence of diminutive and true geometric shapes, and the preponderance of obliquely trimmed forms, combine to class the Tentsmuir microliths with products of the 'broad-blade' industries (i.e. non-geometric) of the Pennines.[3] As a group of this character, the Tentsmuir suite stands alone in Scotland for the purity of its facies. Whereas there is good reason to believe that in the English north country the broad-blade industries are earlier than the 'narrow-blade' with their geometric shapes, it is impossible to make any assertion meantime on the age of the series from Tentsmuir Sands. However, it seems that in the assemblage from this backwater there is represented a survival into the Early Metal Age of the older Tardenoisian facies which reached Scotland early in the Atlantic climatic phase. Even more ancient traditions appear to have been brought to Tentsmuir and to

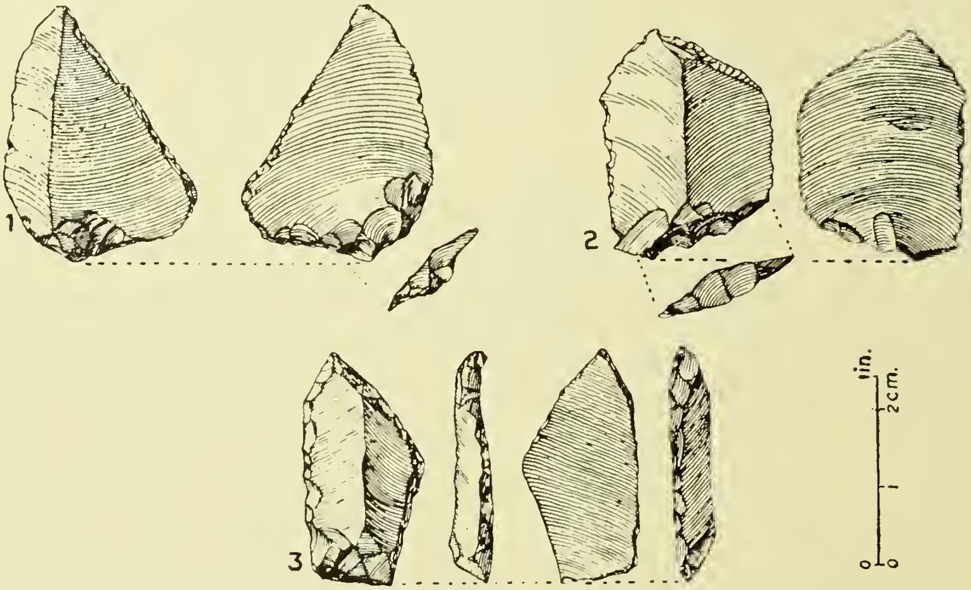

Fig. 123. Steeply dressed broad-blade flint implements from Tentsmuir Sands, Fife.

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[1] Vignard, 1931, pp. 92–103.

[2] Knowles and Barnes, 1937, pp. 201–7.

[3] Buckley, 1924.

have persisted, if the three specimens illustrated in Fig. 123 are any indication. Such objects would be remarkable in any late industry; from a Scottish site they must be noticed as quite exceptional. The faceting and retouching of the butts of nos. 1 and 2, in conjunction with minute steep edge-working, are curious features. The drawings make plain how this fine trimming contrasts with the bold dressing of no. 3, fashioned in a truncated blade. This tool may have served as a graver.

Only future researches will show if the connexion is with the flint industry of the raised beach on the opposite side of the Firth of Tay (pp. 175–8) or with the surface-occurring relics of the Tweed valley (pp. 161–7).

(c) CULBIN SANDS, MORAY

In the region north of the River Dee only the Culbin Sands, west of the Findhorn estuary in Moray, have so far yielded microliths which are sufficiently numerous[1] to suggest that industries comparable with those of the Banchory district flourished in this area (pp. 179–84). The only illustration so far published of examples from these sands is reproduced here as Fig. 124. This group, now incorporated in the national collection at Edinburgh, if not as representative as one would wish, is nevertheless instructive. For the diminutive points (nos. 1 and 2) have been made in material cut by micro-burin technique, but the edge-blunted narrow rods (nos. 3 and 4) have not. Two exceptionally large butt-end micro-burins (nos. 5 and 6) suggest that broad-blade microlithic types similar to those found at Tentsmuir should occur in the Culbin Sands.

There is no record of the conditions in which these microliths were discovered. Therefore it cannot be said whether any can be separated culturally from relics of far later aspect, such as finds consisting mainly of scrapers, knives, and every variety of arrow-head, all manufactured in the many-coloured flint of Buchan, not to speak of polished stone implements, bronze objects, and pottery. In this connexion mention may be made of the discovery of a working-floor a short distance south of Burghead station.[2] Exposed by the wind above the edge of the Early Post-Glacial raised beach, this site has yielded artifacts trimmed in microlithic style, together with flint implements of characteristic Bronze Age workmanship. Hence it is likely that the microliths from the Culbin desert, of which the Burghead dunes are an extension, may be attributed to an industry of Early Metal Age.

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[1] Lacaille, 1944, pp. 13–15.

[2] Davidson, 1947, pp. 28–30.

As such they would point to meetings between peoples, which led to the production of microliths by food-gatherers who possessed the advanced flint technique, rather than to the sojourns of exponents of an unaffected Mesolithic culture.

Farther north, odd microliths have been found in some of the sandy tracts beyond the Moray Firth. So little is known of these areas, however, that all we can say meantime is that they have yielded collections of the usual, well-developed artifacts of flint and other stones. As yet there seems to be no clear link between these series and the relics from the refuse-heaps in the Dornoch region and at Freswick Bay (pp. 266–9).

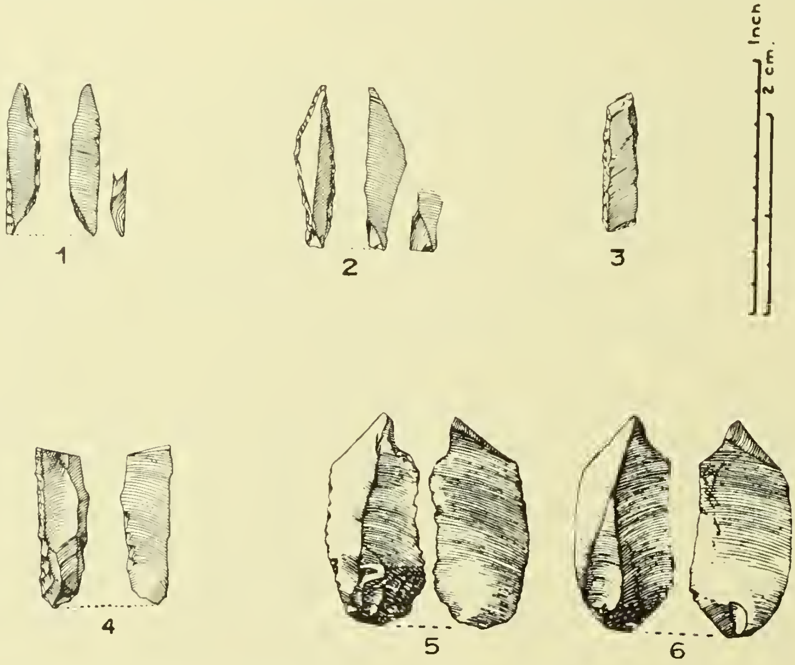

FIG. 124. Microlithic industry from Culbin Sands, Moray.

(D) LUCE BAY, WIGTOWNSHIRE

Turning to the Atlantic seaboard, we cannot doubt that the sand-hills which for miles stretch along Luce Bay, situated as they are in the south-west with all its Larnian associations, ought to provide much evidence of Mesolithic industrial survivals. Unfortunately this locality, which has yielded the largest Scottish collections of prehistoric antiquities, has not so far been closely studied for this purpose. It is best known for the information provided by its many sites in the sand-dunes on progressive stages of Bronze Age cultural development in such an environment.

Inspection shows that in the assemblages of stone implements from Luce Bay there are many more flake- and blade-tools, plain and retouched, than occur normally in representative Bronze Age series. While this in a way points to more than usual discernment on the part of collectors, it also indicates that the traditions of the Larnian culture persisted strongly in the region. This is shown, too, by the numbers of scrapers on blades and dressed pebble-tools, which have been picked up with arrow-heads of all types beside wind-bared hearths and floors with their cruder domestic and workshop equipment.

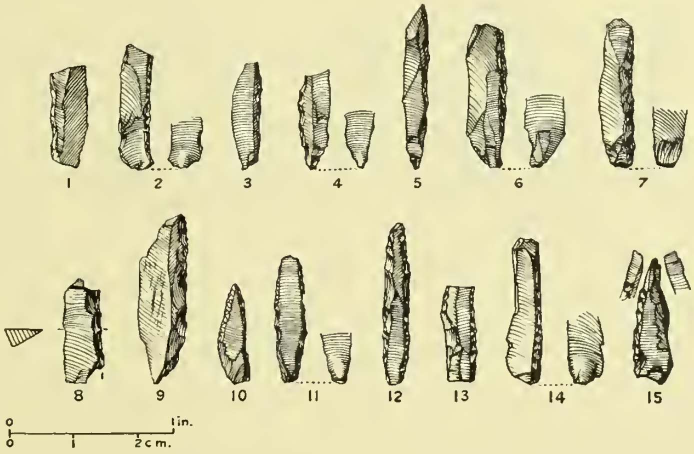

FIG. 125. Flint microliths from the Sands of Luce.

There is an unrecorded group of microliths from this area in the national collection. Fashioned in the finest flint, similar to that of Antrim, its narrow-blade components include Tardenoisian geometric shapes, all as fresh-looking as the implements of the Bronze Age facies from this sandy area. Another series, preserved in the Kelvingrove Museum at Glasgow, consists of diminutive, abruptly edge-blunted blades and rods. These objects are stated to have been found together, and, for reasons not given on the label, to be referable to the transition from the Neolithic to the Bronze Age.[1] On typology the set (Fig. 125, nos. 1–14) is much nearer an Irish surface-found group[2] than any so far encountered in Scotland.[3] Its components are not made by micro-burin technique in the Tardenoisian tradition, but on uncut pieces in the Upper Palaeolithic, probably through the Larnian, a late expression of which has been recognized in the region (pp. 154–6). A few bear the later style of flattish retouch evident in the comparable, but thicker and usually larger, artifacts of the Bann River culture of Northern Ireland. A tiny graver (no. 15) stands out as remarkable.

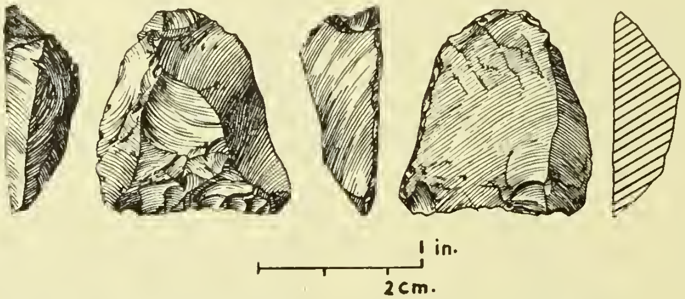

FIG. 126. Pitchstone *tranchet* of early post-Mesolithic type from the Sands of Luce.

The persistence of some types continuing the traditions of the Early Neolithic industry, which certainly once existed on Luce Bay, is shown by a worn straight-edged *tranchet*, a horizontally placed urn, and flints from a Bronze Age burial.[4] This *tranchet* (Fig. 126), now in Kelvingrove Museum, is made on a thick flake of dark green Arran pitchstone. This fact is in itself worthy of note.

(E) SHEWALTON MOOR, AYRSHIRE

In the lower reaches of the River Irvine in Ayrshire, the sands of Shewalton Moor on the left bank (Pl. IX *a*), and Ardeer and Stevenston on the right bank, are spread on top of the well-developed Early Post-Glacial raised beach at an elevation of about 50 feet O.D. Various simple flint implements of Larnian aspect have been found in the Shewalton Sands, a

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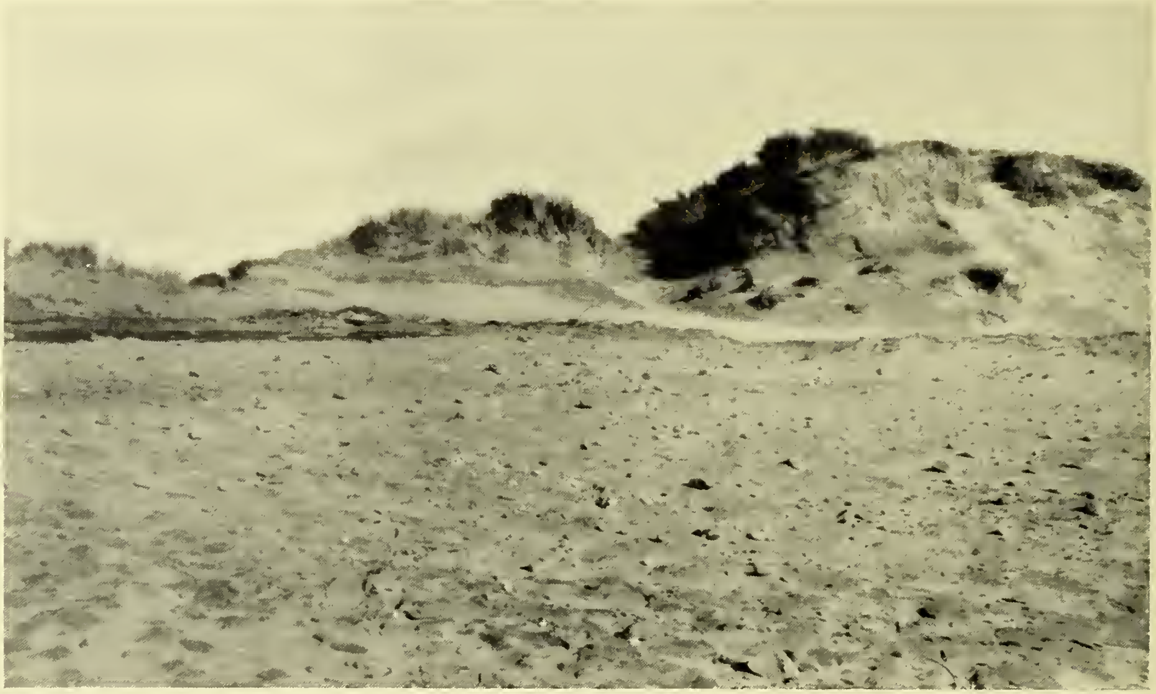
[1] Scottish Exhibition Catalogue, 1911, entry 7, p. 831.

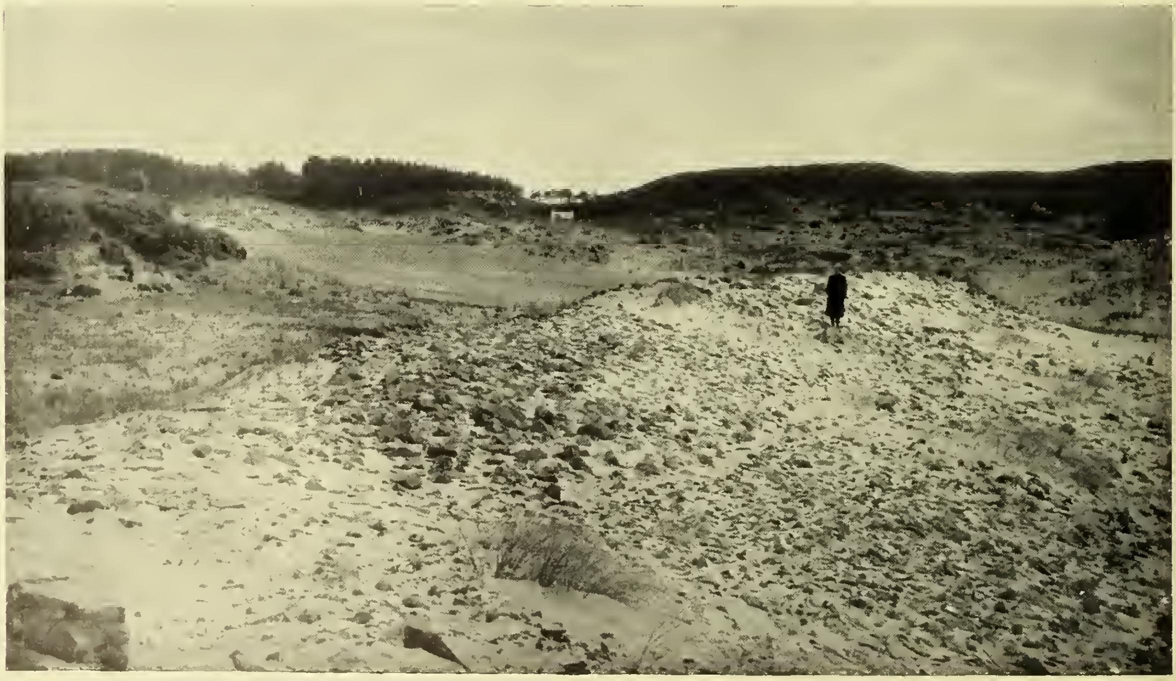
[2] Batty, 1938, pp. 90–94.

[3] Lacaille, 1948, pp. 32–33, and Fig. 11.

[4] Ibid., pp. 37–38.



(*a*) OCCUPATION-SITE IN SAND-DUNES, SHEWALTON, NEAR IRVINE, AYRSHIRE



(*b*) ANCIENT STORM-BEACH FRONTING EXTINCT BAY AND OCCUPATION-SITE THEREIN, RUDHA'N ACHAIDH MHÒIR, MORAR, INVERNESS-SHIRE fact which illustrates that the traditions of the old coastal Mesolithic industries died hard. Microlithic forms have been collected in all three sandy expanses, but in very small proportion to the immense numbers of relics of later facies left here by generations of settlers. By far the most important is a group of artifacts (now in the National Museum of Antiquities) made in flint of various colours, chalcedony and quartz, belonging to a homogeneous industry found isolated on an old land-surface on the Shewalton Moor.[1]

The microlithic series, of which a selection is figured (Fig. 127, nos. 1–24), includes scalene (no. 1), and equilateral triangles (nos. 2–4) passing into trapezes (nos. 5–7), lunates or segments (nos. 14–16), a variety of fully or partly edge-blunted blades (nos. 8–10, 13, 17, 18, 23, and 25), and subtriangular objects (as no. 11). Awls (e.g. no. 12) and finely trimmed scrapers (as no. 24) are common. Implements surface-worked in Neolithic or Bronze Age technique appear in arrow-heads, slug-shaped (as no. 19), leaf-shaped (as no. 20), and triangular (as nos. 21 and 22). Together, the presence of the trapezes and the absence of micro-burins distinguish the group from others described in these pages and would indicate a late dating for this industry. Supported by the pressure-trimmed arrow-heads, this is proved conclusively by the most arresting item in the set (no. 26). This, executed in microlithic style, is nothing but a poor copy of a barbed-and-tanged arrow-head embodying the form and idea introduced by the Beaker folk. Evidence that this people resorted to the Shewalton Moor is found in every form.[2]

It has been observed that the Shewalton microlithic industry is comparable to that at Zonhoven, Belgium.[3] At Zonhoven, above the 'broad-blade' industry there occurs a later one with trapezes and pressure-flaked points, but no micro-burins. It is attributable to the final Tardenoisian of Belgium, and it overlaps in time with the Neolithic. However, it is a question whether the trapeze, as represented at Shewalton, is an independent development, a link with the English industries in which the form was manufactured as a derivative of a continental product, or a growth from the small *tranchet* (flake) of the Irish and Scottish Early Neolithic facies of the North Channel coasts. The nearest approximation to the form in Scotland is one of a series of rectilinear microlithic shapes from Ballantrae,[4] the Scottish type-site of the Early Neolithic industry and counterpart of that of Ulster. Such are the circumstances of discovery and the condition of these advanced microlithic forms from the Stinchar estuary that it is reasonable to believe that,

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[1] Lacaille, 1930.

[2] J. Smith, 1895, pp. 107 ff.

[3] Clark, 1932, p. 50.

[4] Lacaille, 1945, pp. 102–4, and Fig. 5, nos. 80 and 81.

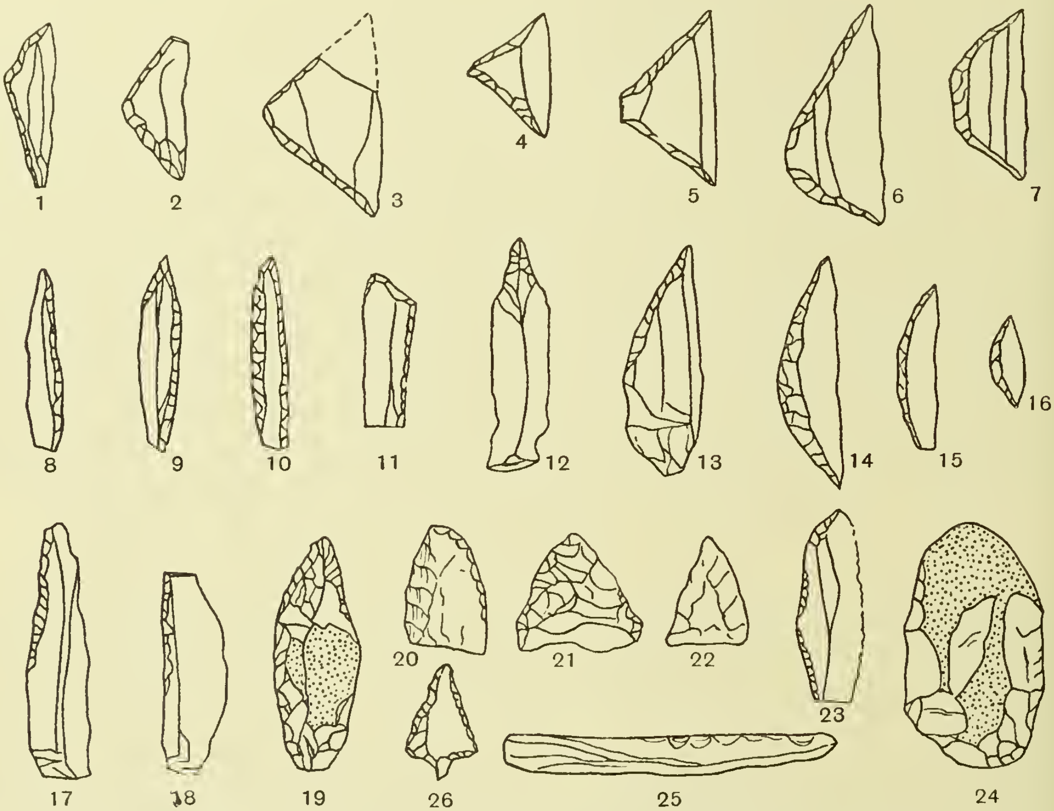

Fig. 127. Microlithic industry from Shewalton Moor, near Irvine, Ayrshire. ($\frac{1}{1}$) (From Clark, 1932, after Lacaille, 1930.)

like those from Shewalton, they are coeval with the Bronze Age artifacts found with them. These include scrapers, knives, barbed-and-tanged arrowheads, and core-gravers. The last, classed with some of the crude gravers from Orkney sites (p. 270, and Fig. 119, nos. 12 and 14), resemble the thick, flint triangles—of western European Late Tardenoisian (Neolithic) type (Fig. 113, nos. 20–23)—found on the lower slopes of the Castlereagh Hills, Co. Down.[1]

[1] Whelan, 1938, p. 135, and Fig. 10, nos. 20–23.

More spectacular than these stone implements as survivals into an age of more advanced culture is a bilaterally barbed point (Fig. 128) recovered in 1938 from the bed of the River Irvine at Shewalton.[1] Beautifully made in red deer antler, the specimen, 19·4 cm. long, is the largest of its kind found in Britain. It bears a general resemblance to certain barbed points from MacArthur's Cave at Oban (particularly no. 10 of Fig. 81), but is much thicker. The grooves on both sides of the pronounced midrib, designed to facilitate penetration, and the elongation and rounding of the tip, may suggest that influences going back to the Baltic Maglemosean reached this district, as they appear to have done in Kintyre. Although now wanting the lower end, this piece of fishing-tackle is otherwise perfect. It has preserved wonderfully well its bony appearance and colour, and it contrasts strikingly with the mineralized and bleached points from Oban and Oronsay. It differs still more from the now very dark and stone-like specimen from the bed of the Dee at Cumstoun, Kirkcudbright-

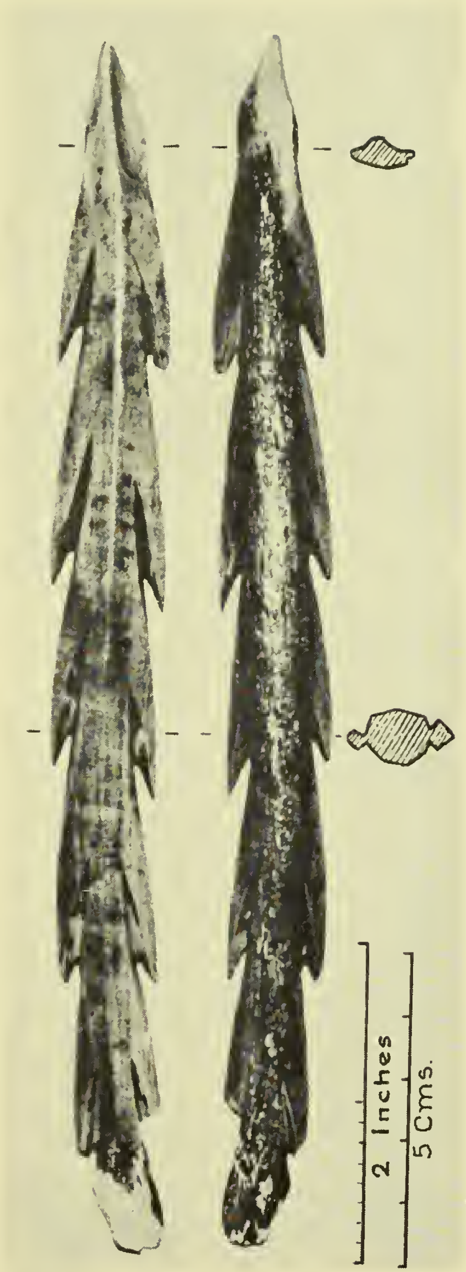

FIG. 128. Barbed point of red deer antler from bed of River Irvine at Shewalton, Ayrshire.

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[1] Lacaille, 1939. This specimen is now in the National Museum of Antiquities.

shire (Fig. 57). The condition and appearance of the Shewalton point strongly suggest that it was of later manufacture but do not prove this assumption. However, the topography of the Irvine estuary shows that when the implement was lost by an unlucky fisher the course of the river would be much the same as it is today, for its channel could not have been so formed until the emergence was completed after the regression of the Early Post-Glacial sea. A relatively late post-Mesolithic dating is therefore indicated for this stray find, which in style and execution illustrates the survival of earlier traditions, and is an indication of the pursuits of the squatters in the Shewalton sand-dunes.

3. THE HYBRID INDUSTRIES OF THE WESTERN SEABOARD

It has been indicated that the true Mesolithic cultures spread very slowly, and gave rise to regional growths along the much indented west coast and adjacent islands from Kintyre northward. Comparable retardation and developments are illustrated in the diffusion of later strains in the same area of distribution, and appear in the mixed industries of the long-persisting food-collecting economy that is clearly evidenced at coastal sites. This region is so vast and the sand-dune tracts so numerous that only those which have proved most informative need be mentioned. Of the sandy tracts explored recently over a stretch of nearly 250 miles, the southernmost are the Lange Links on top of the Early Post-Glacial raised beach between Machrihanish and Kilkenzie, on the ocean side of the Kintyre peninsula; the most northerly are on the west coast of Lewis in the Outer Hebrides. Intermediate localities enable us to trace the spread of the most primitive expressions of culture, to assess contacts and survivals of ancient industrial traditions, and to conclude that the Stone Age lasted a long time on the periphery of the Highland Zone of Britain.

(A) LANGE LINKS, KINTYRE, ARGYLL

Arrays of stone artifacts, little different in general character from assemblages found in other sandy areas occupied by food-gatherers, have been recovered from the Lange Links. The associations of these relics seem to lie more with those from the seaboard of north-east Ireland than from the coast of Scotland. Their most interesting feature is the strength of Late Larnian tradition, shown by a number of quite heavy forms flaked in quartz and schistose grit which have been picked up on several floors, along with pressure-worked arrow-heads, and knives and scrapers of flint. Taken in conjunction with axes, the larger tools suggest implements manufactured to deal with wood, since here the remains of Sub-Boreal trees abound in the peat-hags.

(B) ARDNAMURCHAN, ARGYLL

Sand-dunes occur at many points on the north coast of Ardnamurchan and for miles beyond in the region known as the Rough Bounds (Gael. *na-Garbh-Chriochan*),[1] which also includes the Inverness-shire districts of Moidart, Arisaig, and Morar. In this remote part of the West Highlands, bent-covered hillocks of silver sand rest upon the variably developed Early Post-Glacial raised beach, behind many of the rock-girt and skerry-guarded bays which notch this rugged coast. Locally the raised beach is backed by a cliff pierced with as yet unexplored caves. Some of these openings probably sheltered families of food-gatherers and migrant bands, whose relics have been found in neighbouring sandy tracts. In all the documented collections assembled recently at these sites some aspect of Bronze Age industry appears more or less strongly in conjunction with Mesolithic survivals. These derive from the Obanian industry, as represented in the comprehensive late facies of Risga Island off the south shore of Ardnamurchan.

(i) SANNA BAY. The University Museum of Archaeology and Ethnology at Cambridge contains some highly significant relics from the coast of Ardnamurchan. Sanna Bay, two miles north-east of Ardnamurchan Point, is the nearest recorded sand-hill site to Risga and the most western prehistoric station on the mainland of Great Britain. Here, upon an old land-surface in the sand, were found a cremation-burial, a shell-midden, and two occupation-layers.[2] The upper yielded bronze objects and coarse pottery like that made until recently in the Hebrides. The objects found in the lower layer are illustrated in Fig. 129. They comprised fragments of ornamented Beaker ware (no. 1), buchite and flint flakes, including a flatly and finely retouched knife (no. 2), a side-scraper (no. 3), a barbed-and-tanged arrow-head (no. 4), and two ground basalt axe-heads, one broken and unfinished (no. 5), the other complete and showing the influence of metal types (no. 6). With these were microliths made in the Tardenoisian tradition, including a micro-burin actually dressed in the notch and along an edge to form an implement (no. 7), a trimmed sliced nodule combining a perforator and side-scraper (no. 8), and a core (no. 9). These flints would be quite in place in an Obanian or Scottish advanced Larnian series.

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[1] C. Macdonald, 1888, p. 1.

[2] Lethbridge, 1927.

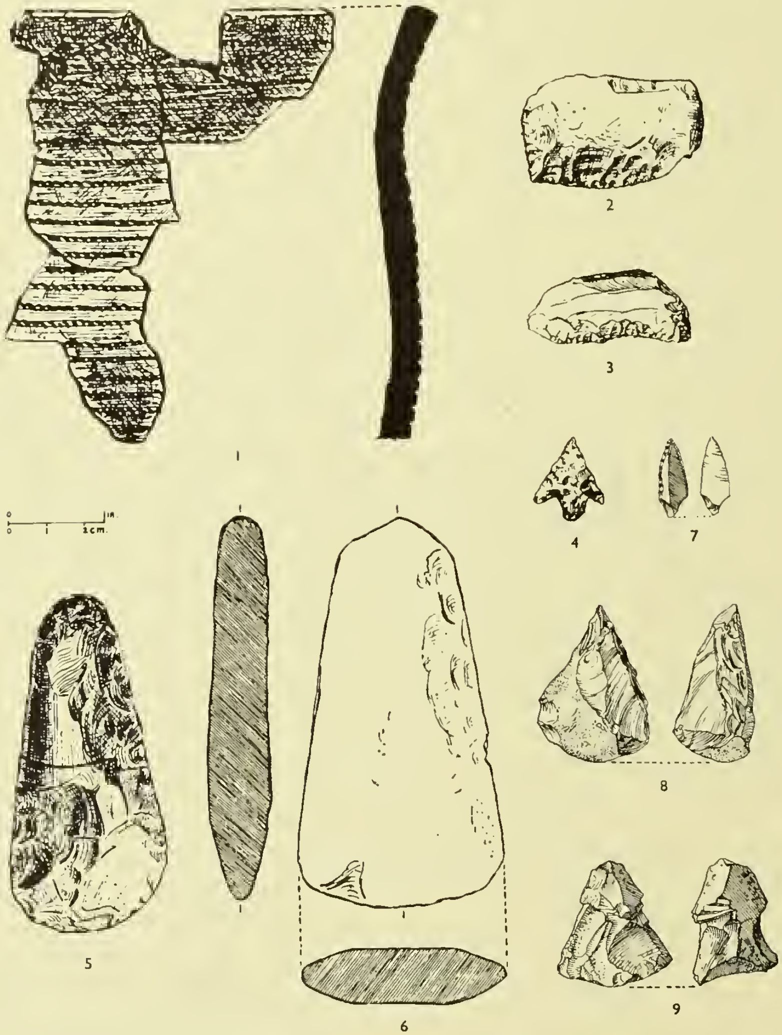

FIG. 129. Industry from Sanna Bay, Ardnamurchan, Argyll. (Nos. 1–6, after Lethbridge, 1927.)

(ii) CUL NA CROISE. Eleven miles east of Sanna Bay, at a site in the sand-dunes behind the small bay Cul na Croise, opening on the great indented bight of Kentra between the north-east corner of Ardnamurchan and Moidart, sherds of Beaker ware, and buchite and flint artifacts have been collected. These include leaf-shaped and barbed-and-tanged pressure-trimmed arrow-heads, minute round scrapers, and many small pointed narrow blades, besides a few sub-geometric forms, all abruptly edge-blunted in the best microlithic manner.[1] As this group certainly represents an extension of the older facies of Sanna Bay, one may well ask when Beaker influences reached the Rough Bounds of the West Highlands, and where the people of the Early Metal culture came into contact with the exponents of more primitive industries. These questions, it seems, are partly answered by the output of a most prolific stone industry at Drynan Bay, just south of Cul na Croise.

(iii) DRYNAN BAY. Quartz was the principal material used in the active industry from the sand-dunes of Drynan Bay.[2] Some green quartzite was used, and, surprisingly enough for the region, much flint. This flint seems to have been carefully selected from the usually indifferent and weathered pebbles from the Tertiary beds of Ardnamurchan, Morven, or Mull, which were probably brought by man to the working-site.

Besides quantities of workshop waste, the place has yielded series of well-defined implements, remarkable for a mixture of facies and as a link between Risga and sites north of Kentra. The groups of artifacts, at present in private hands, include all the salient forms such as occur in the comprehensive Obanian industry from that island, a great variety of flakes, a sprinkling of blades worn or retouched along the margins, and scrapers made on them. Among the products of the place there are crude axe-like tools boldly flaked to an edge in the manner of the rough Obanian pebble- and flake-tools. Variants are fairly frequent in the shape of heavy choppers which resemble those of the Scottish Obanian and north-east Irish Late Larnian. An example manufactured in a quartzite cobble is singled out for illustration (Fig. 130, no. 1) as a type much favoured at coastal sites, particularly in the western and north-western part of the country. Heavy scrapers (e.g. no. 2), formed out of pebbles and in Late Larnian style, are noteworthy. Pick-like tools (e.g. no. 3), improvised or flaked to a working-end on rods and flakes, demonstrate that the settlers in the sandhills at Drynan Bay had needs similar to those of the Larnians on the shores of the North Channel. Their true picks can be distinguished from short and narrow objects worn to a round or bevel, like those Obanian improvised implements, which modern analogy indicates were employed as limpet-hammers.

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[1] Lethbridge, 1925, pp. 105–8.

[2] Lacaille, 1951, pp. 130–3.

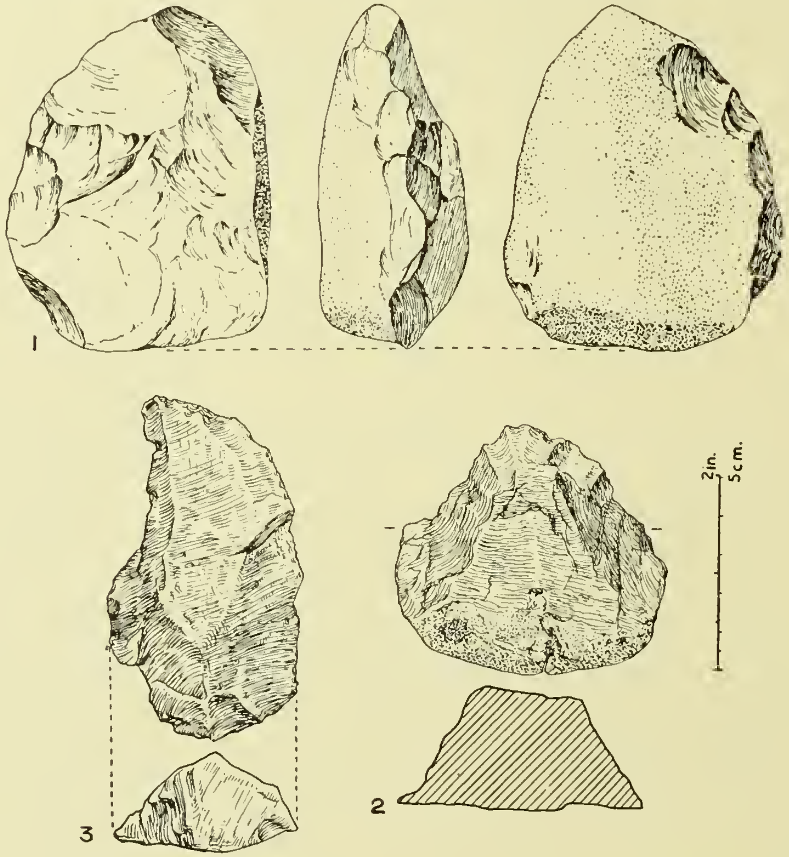

Fig. 130. Heavy stone implements from Drynan Bay, Kentra, Ardnamurchan, Argyll. (No. 1, quartzite; nos. 2 and 3, quartz.)

Among the flints is a small pick of the Larne type (Fig. 131, no. 1), which is identical with those produced in the Larnian industries. Together with fine parallel-sided and leaf-shaped blades (as nos. 2 and 3) there are many scrapers, steep variants of which recall Obanian and Larnian work (e.g. no. 4). These differ entirely from the roundish types trimmed by close retouch in characteristic Bronze Age manner (as nos. 5 and 6). There also occur small scrapers, abruptly edge-dressed like microliths, nos. 7 and 8 being typical. Forms in true Tardenoisian tradition are well represented by diminutive segments made in blades cut by micro-burin technique (nos. 9 and 10), waste from this method being exemplified by fine blades notched for division (e.g. no. 11). Parent cores are common (e.g. no. 12).

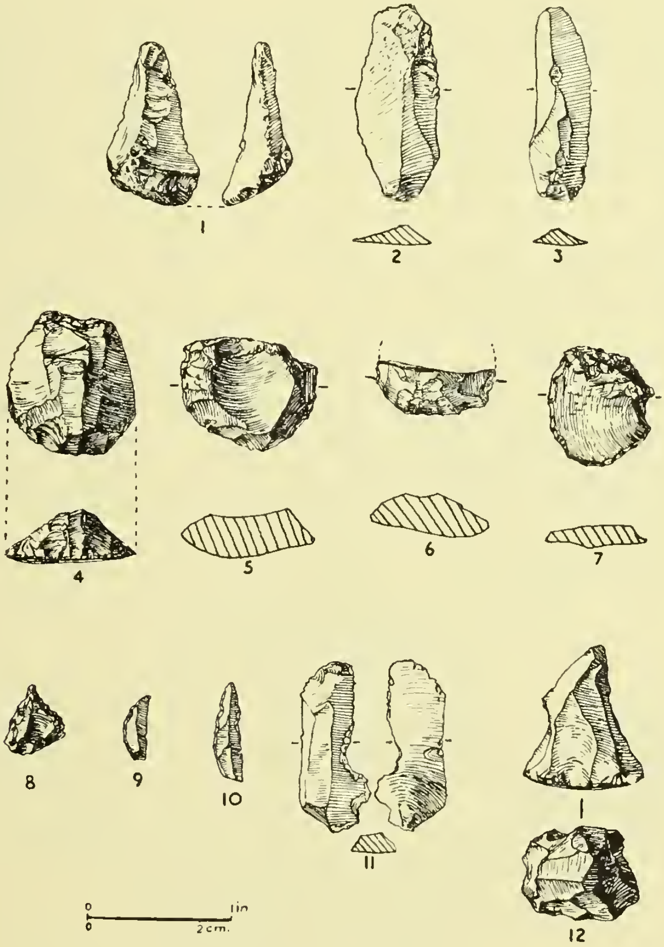

FIG. 131. Light implements of flint from Drynan Bay, Kentra, Ardnamurchan, Argyll.

This assemblage, which cannot be anterior to the Bronze Age, illustrates probably more clearly than any other homogeneous industry in Scotland the persistence of several Mesolithic traditions. The squatters, who practised here the various modes of stone-working, certainly continued the food-collecting habit as one would expect in this remote region, and as is shown by the abundance of rough Obanian and even ancestral Larnian forms. The varied output of this hybrid industry demonstrates, therefore, the coming together of descendants of the Obanians and of people of a later cultural stage of development. At the earliest these contacts could not

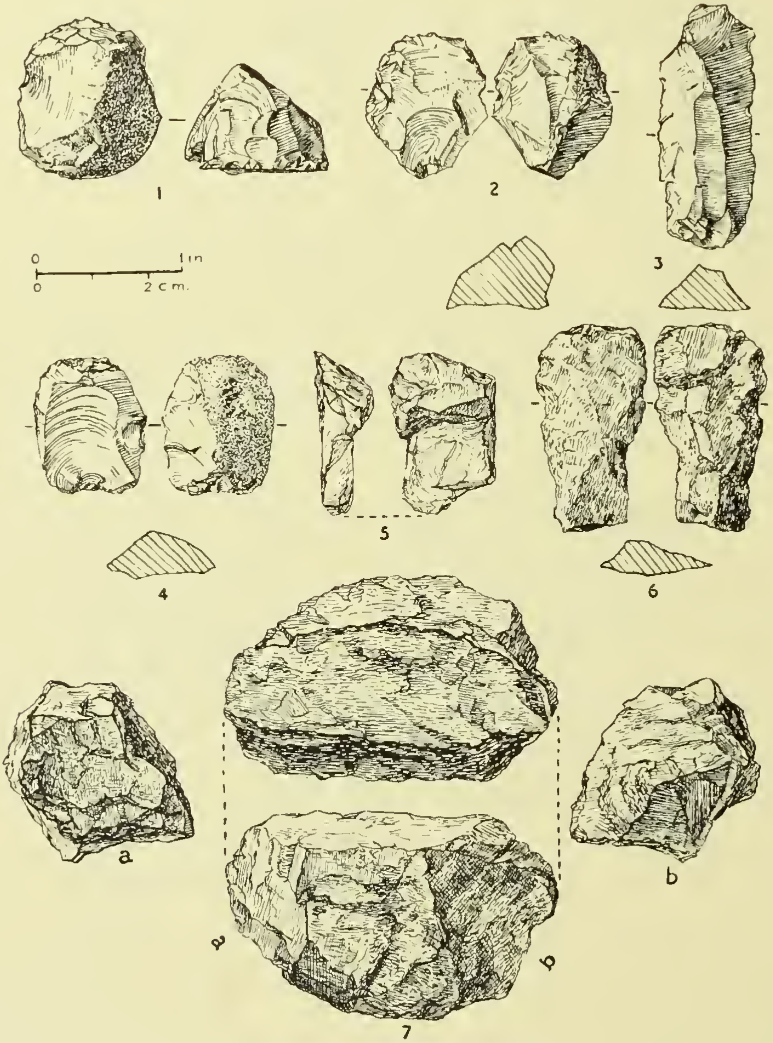

FIG. 132. Flint (nos. 1–4) and quartz (nos. 5–7) industry from under peat at Bruach na Maorach, Kentra, Argyll.

have taken place until the Sub-Boreal climatic phase was far advanced. For it has been seen that the full Obanian industry of Risga, from which so many elements in north-east Ardnamurchan derive, cannot be much earlier (pp. 242–3). Where the actual meetings took place remains to be determined, but the Drynan Bay sand-hill industry shows that they did in fact occur on the coast of the great peninsula.

(iv) BRUACH NA MAORACH. Two miles east of Drynan Bay, at the head of Kentra Bay, a small group of flint and quartz artifacts (Fig. 132), light (nos. 1–6) and heavy (e.g. no. 7) forms of Obanian and Late Larnian aspect, has been found under peat below the wooded Bruach na Maorach (the Shell-fish Bank). This stone industry is interesting primarily as the first from a Scottish site in connexion with which a pollen-analysis has been made.[1] The substantial amount of alder indicates that the peat must be of post-Boreal age, and the statistics of small plants show that conditions were far from closed woodland. Birch is abundantly represented, but this is characteristic of the north and west over long periods, as may be seen by comparing the two pollen-diagrams for Inveroran, Argyll (above, p. 64, Figs. 23 and 24). When there is a much closer network of west Scottish diagrams, and the regional forest history is better known, it is possible that these results may be fitted to some definite horizon.

(c) MORAR, INVERNESS-SHIRE

The facies of mixed parentage, believed to have developed in Ardnamurchan, was carried beyond this region. This is well shown forty miles away at Rudha'n Achaidh Mhòir in south Morar.[2] Here, north of the small stream Allt Cuirteach, food-gathering squatters found a most convenient habitat in an extinct bay of the Early Post-Glacial sea (Pl. II *b*), protected on the landward side by hills and sheltered from sea-winds by a storm-beach dam and sand-dunes (Pl. IX *b*).

The native quartz served for most of their tools (Fig. 133). Light implements are represented by flakes and blades (nos. 1–3), many worn from use as scrapers and knives. Retouched specimens include the common types of knives (nos. 4 and 5) and scrapers (no. 6), besides 'fish-tail' concave examples (no. 7), and perforators (e.g. no. 8). A few well-flaked cores are present (e.g. no. 9). The heavy equipment for dealing with large bones and

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[1] Godwin, in Lacaille, 1951.

[2] Lacaille, 1951.

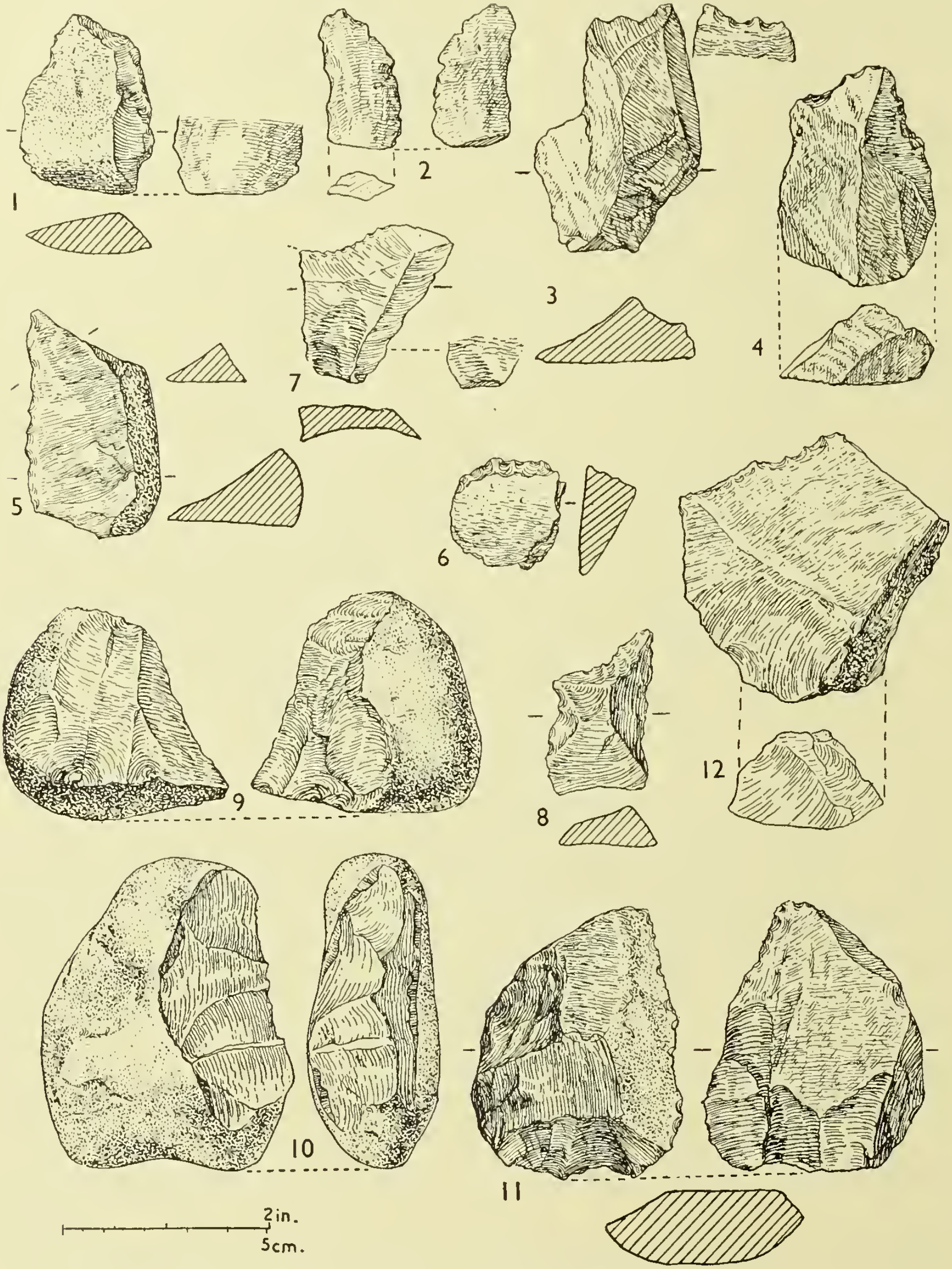

FIG. 133. Quartz industry from Rudha'n Achaidh Mhòir, Morar, Inverness-shire.

possibly wood, and the preparation of carcasses, is composed of boldly flaked edge-tools, mainly choppers, crude axe- and adze-like objects (nos. 10 and 11), and exceptionally large dressed scrapers (e.g. no. 12). These are accompanied by hammer-stones, much abraded and scarred, apparently from flaking stone. Several beach pebbles and quartz rods are worn at the ends in the same way as limpet-hammers (e.g. Fig. 105, no. 2).

The similarity of the Morar and Drynan Bay industries, which evidently owe much to Obanian tradition, is enhanced by elements manufactured in flint. Smaller than the main range of quartzes, the series from Rudha'n Achaidh Mhòir includes fine flakes and blades, one bearing most delicate, flat parallel trimming along an edge, applied by pressure and typical of well-developed Bronze Age workmanship. Forms made in the Tardenoisian tradition were probably produced here, since a plain butt-end micro-burin and small cores are recorded.

Some shell-refuse and bones have been recovered. One piece appears to have been cut and scratched with a stone implement.

(D) THE HEBRIDES

The northward movement along the coast beyond Ardnamurchan, which is indicated by the Morar industry, had westerly counterparts emanating from the mainland. These bore the Mesolithic and later traditions to some of the Inner Isles and eventually to the Outer Hebrides, where in time owing to new and powerful influences they faded to mere echoes. A few instances only need be mentioned as evidence of this diffusion.

(i) COLONSAY AND THE UISTS. On Colonsay a group of artifacts was picked up on an old land-surface in the sand-hills at Balnahard. The description and illustrations,[1] some of which are reproduced in Fig. 134, refer to flint blades (nos. 1 and 2), a trimmed Larne pick (no. 3), small cores (no. 4), a barbed-and-tanged arrow-head (no. 5), stone axes, and also long shingle-stones with ends rubbed down or broken from forceful use. Although these shingle-stones resemble the worn pebbles from the occupation-refuse of Oban, Oronsay, and Risga, yet the industry with which they are associated belongs to a culture as advanced on the Obanian as that represented at Sanna Bay (pp. 289–90). That they may nevertheless be a direct link with an Obanian industry which once flourished in Colonsay is of course possible, since on this island there stand mounds similar to those explored on the adjacent Isle of Oronsay.

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[1] Wright and A. M. Peach, 1911, pp. 164–75.

Comparable assemblages indicating survivals and blendings are known from such islands as Tiree and Coll, the nearest to the peninsula of Ardnamurchan. Tiree has yielded several flint implements in the Larnian flaking tradition (p. 154); and remains of a stone and bone industry from a shell-heap on Coll suggest an extension of the Obanian culture.[1]

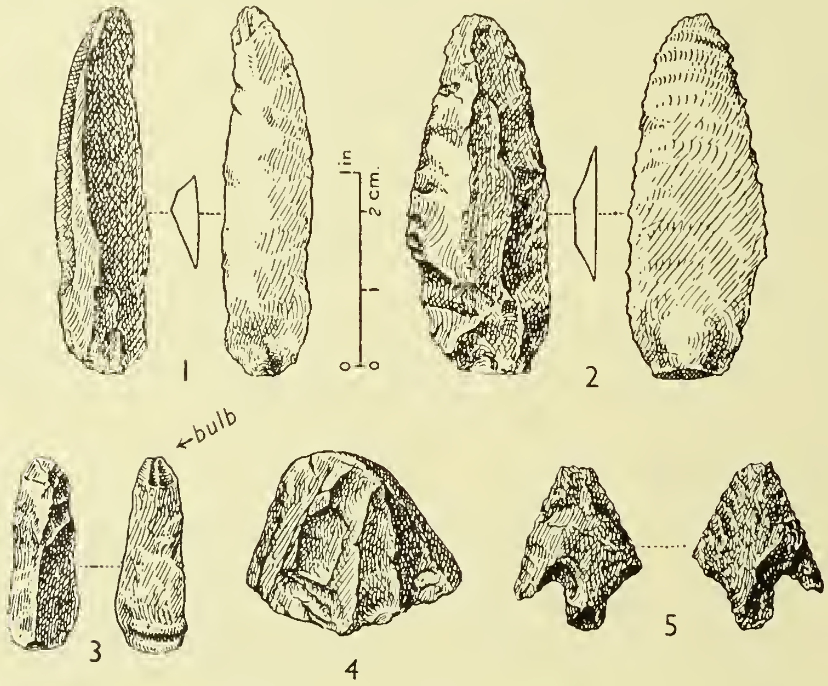

FIG. 134. Flint industry from Balnahard, Colonsay. (After Wright and A. M. Peach, 1911.)

In these industries of food-gatherers encamped among the sand-dunes of the small islands, and on the coast of the Rough Bounds, nothing suggests any Megalithic connexions. The available evidence of artifacts shows that the same holds where the relics of strand-loopers in some of the Outer Hebrides are concerned. Thus the output of a flint industry from the sands of Daliburgh on the west side of South Uist exhibits marks of the workmanship introduced by invaders in a stage of Bronze Age culture.

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[1] Scottish Exhibition Catalogue, 1911, entry 11, p. 812.

Its products, which are associated with a few crude bone implements, include barbed-and-tanged arrow-heads, edge-retouched blades, and small round scrapers. That the groups from here must be relatively late would appear, not only from the remoteness of the place where they were found, but also from their generally atypical facies which indicates a degraded technique. This island and its neighbour, North Uist, where similar finds have been made, may not have been reached by a direct forty-mile sea-passage from the mainland, but rather as the culmination over generations of a process of hugging coasts which, affording the shelter of bays and caves, provided ample subsistence.

(ii) ISLE OF SKYE. No relics comparable with those mentioned above have so far been recorded, from the mainland shores north of Morar or from the east side of the Isle of Skye, to suggest that the elements of coastal culture gained the Outer Isles. However, in south-west Skye, in a cave excavated at Rudh'an Dunain, a poor quartz industry reinforced with bloodstone from Rum, ten miles to the east, has been revealed in successive Bronze Age layers, the most prolific of which also yielded Beaker ware.[1] With one of these relic-beds the industry of Rudha'n Achaidh Mhòir in south Morar may well be correlated.

It is tempting to see some connexion between the mainland and island industries in a remarkable series of buchite, or vitrified shale, artifacts from Tote, Skeabost, at the head of Loch Snizort Beag. This series is now in the University Museum of Archaeology and Ethnology at Cambridge. A weathered appearance enhances the archaic character of these specimens which, however, were found in two Bronze Age cairns, and which very clearly belong to the same industry (Fig. 135). They include fairly large, fine blades (nos. 1–3), some retouched (as nos. 3 and 4), a few cores (e.g. nos. 5 and 6), one apparently having served as a scraper (no. 6), and a steeply dressed trimming-flake (no. 7). An abruptly edge-blunted microlith, made on a narrow blade, very probably cut by micro-burin technique (no. 8), constitutes the most northerly example of the kind in the British Isles.

(iii) VALTOS, UIG, LEWIS. So far it cannot be said if the artifacts from Tote on Loch Snizort Beag register a spread of migrants from the Outer Hebrides to Skye across the fifteen-mile wide Little Minch. Nevertheless, whether the implanting of some ancient industrial traditions in Harris and

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[1] Scott, 1934, pp. 200 ff., and the Appendix by Clark, pp. 222–3 and Fig. 1.

Lewis is due to an extension of a movement from North Uist, or from the Isle of Skye, proof of their persistence appears on Lewis, much better known for its spectacular monumental remains, religious, defensive, and domestic, which persisted from the late Bronze Age through the Iron Age into early historic times. On the one hand, various objects found on the surface and in habitations show that stone and bone long continued to serve the metal-users for domestic and hunting-gear. On the other hand, the developments of the advanced prehistoric culture, peculiar to this remote and self-contained region, are reflected at the occupation-sites of backward communities whose economy was based on food-gathering. This is shown by a group of relics.

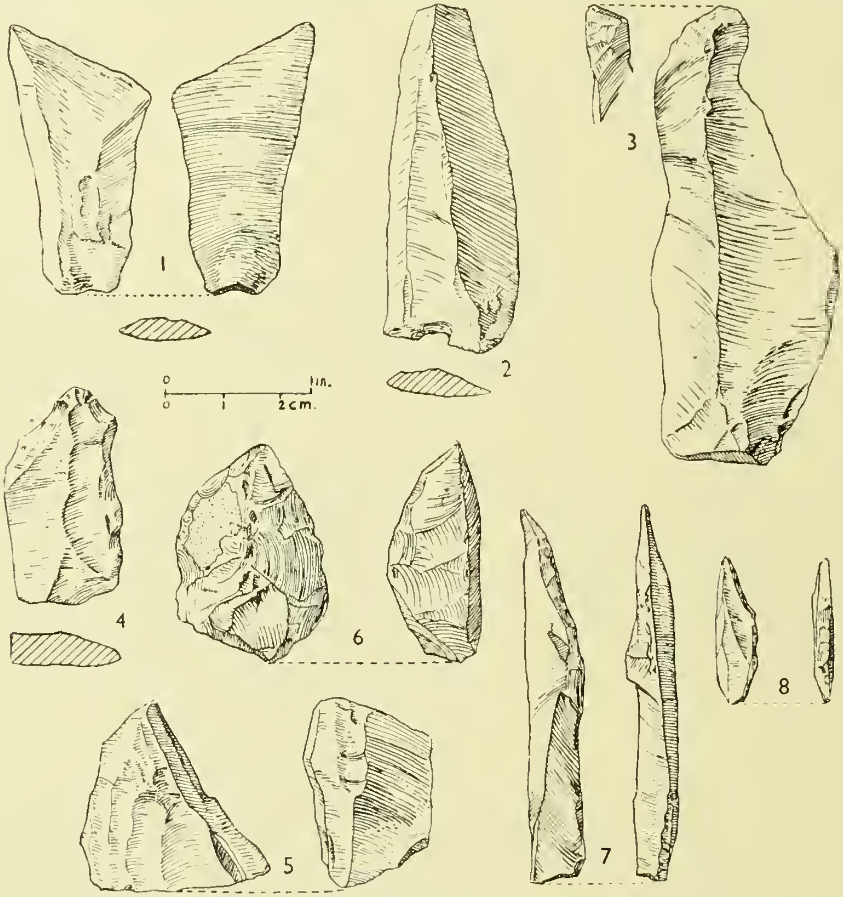

FIG. 135. Buchite industry from Tote, Skeabost, Loch Snizort Beag, Isle of Skye.

On the west coast, at Valtos on Loch Roag, in the Lewis parish of Uig, hut-circles, kitchen-middens, and a working-floor (Fig. 136)—30 feet above sea-level—in hollows in the Berie Sands (Traigh na Beiridh), have yielded quantities of animal bones, mainly red deer, some cut and sawn, together with shell-refuse, burnt hearth-stones, and a prolific stone industry.[1] The output of this stone industry included abraded hammer-stones, fine blades and flakes, cores, knives, and scrapers. Owing to the tractability of the native vein-quartz used in their manufacture, these implements are well defined though atypical (Fig. 137, nos. 1–12). Despite this, their facies pertains to the Atlantic seaboard, their nearest parallels lying in the products of some Late Larnian or Obanian industries.

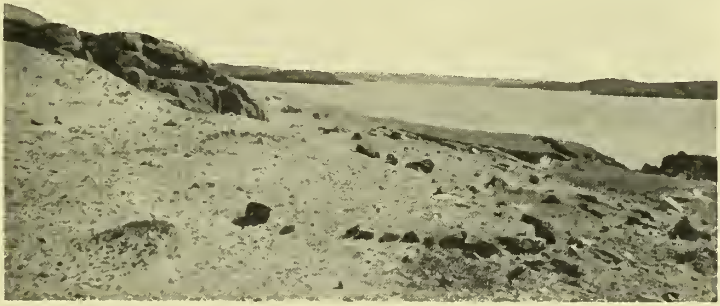
Fig. 136. Occupation-site, Berie Sands, Valtos, Uig, Lewis.

An abundantly represented heavy equipment (Fig. 138), certainly made by anvil-technique, consists of big scrapers and choppers fashioned on cores (e.g. no. 1) and flakes of the local gneiss, mylonite, and biotite-granite (nos. 2–6). Large, untrimmed slices of these materials, which are very common, probably served as knives and scrapers. These objects, whether shaped or not, would be classed, not so much with the more massive flaked edge-tools and plainer implements produced in the industries of the older facies from some of the coastal sites mentioned above, as with the elementary forms from the prehistoric dwellings and from the surface in Caithness and the northern islands. More particularly, they can be classed with the stone tools of the broch-dwellers and their contemporaries.

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[1] Royal Commission, 1928, no. 98, p. 29; Lacaille, 1937, pp. 279–96.

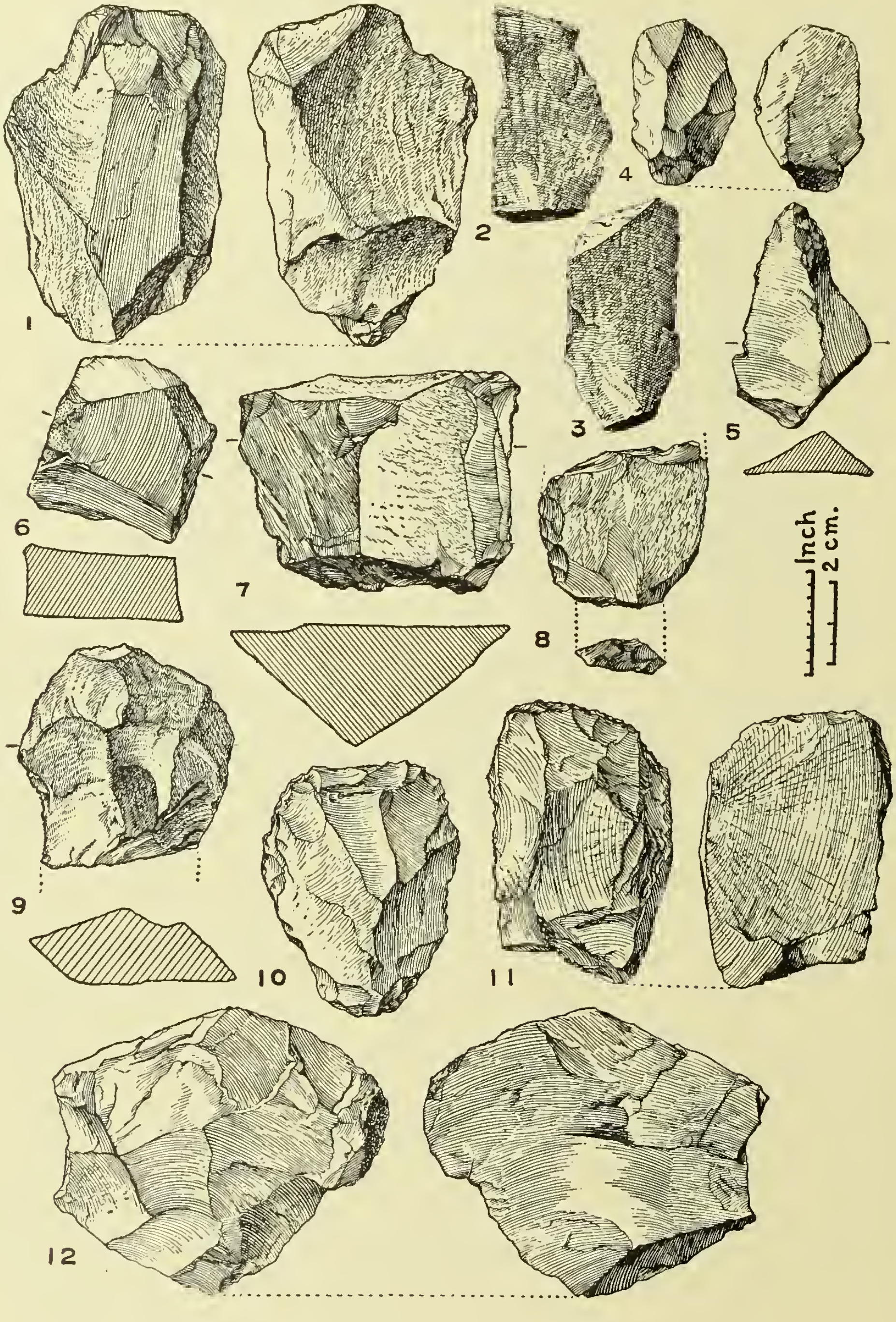

Fig. 137. Quartz industry from Berie Sands, Valtos, Uig, Lewis.

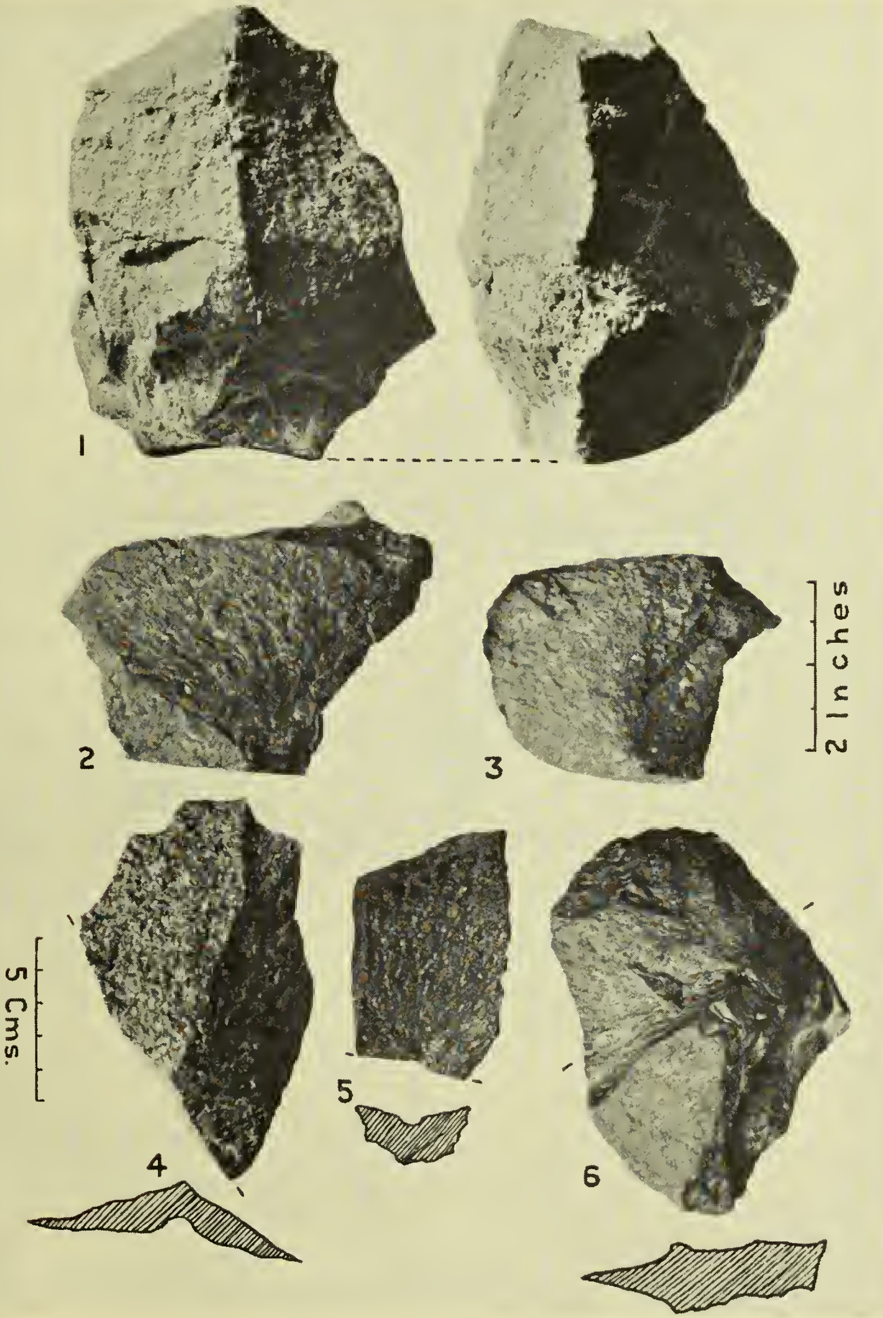

FIG. 138. Heavy implements of gneiss, mylonite, and biotite-granite from Berie Sands, Valtos, Uig, Lewis.

Other relics found at Valtos support this view, among them spherical stones bruised in pounding grit for backing potter's clay, besides red, brownish, and grey decorated and plain sherds. The rims, the ornamentation, and the quality of the well-fired pottery are characteristic of broch ware (Fig. 139).[1] One piece bears the impression of rushes as if produced by basket-work, another of cereal grains. It may well be, therefore, that the settlers practised agriculture in a small way, although depending principally on what the rocky shore provided, and on hunting in the treeless grounds behind their dwellings. The finding of such domestic appliances as much-worn saddle-querns, ordinary and bun-shaped rubbers, and of slag and pieces of red Samian ware,[2] is enough to date the whole assemblage relatively late. These relics are, of course, coeval with many remains from other areas of sand-dunes. But unlike these other remains, which can so seldom be separated from earlier or later antiquities, the Valtos group provides at once a clear instance of homogeneity and of survival of methods believed to have been first brought into Scotland early in the Post-Glacial period.

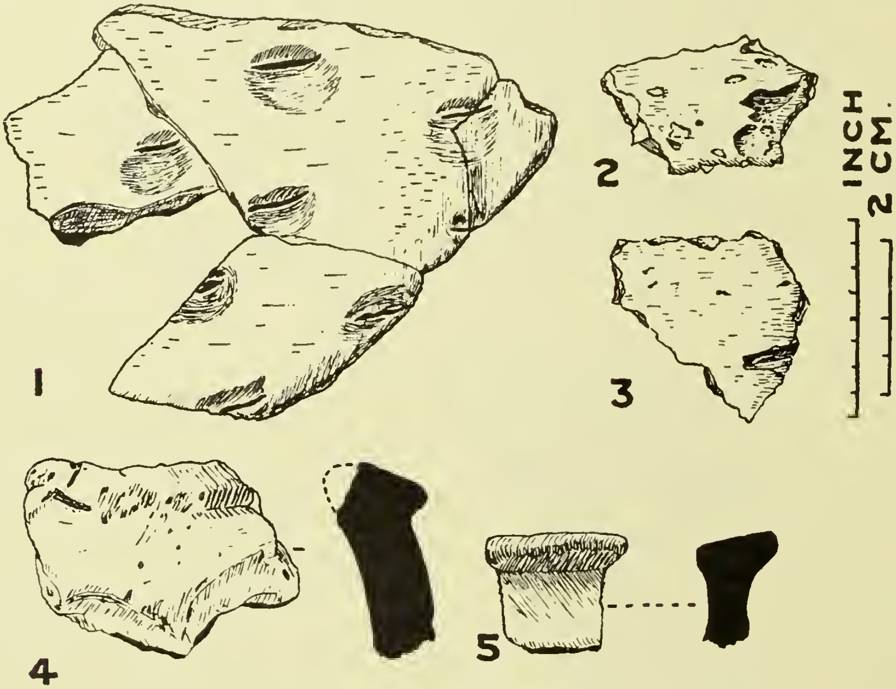

FIG. 139. Potsherds from Berie Sands, Valtos, Uig, Lewis.

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[1] Lacaille, 1937, p. 294.

[2] Royal Commission, 1928, no. 98, p. 29.

X

SUMMARY AND CONCLUSIONS

1. THE BACKGROUND

1. KNOWLEDGE of the earliest men in Britain is derived mainly from stone implements, the most ancient and indisputable of which belong to the Abbevillian and Clactonian cultures. Little is known of the spread of the men who made these implements, or of contemporary animals north of the Thames basin, during the opening phases of the Pleistocene epoch of the Quaternary era.

The second interglacial period (the Mindel–Riss of Alpine chronology), immensely long and with a genial climate, may have witnessed the wanderings of man in early or middle stages of Acheulian culture beyond the latitude of Bridlington, the northernmost finding-place of any Lower Palaeolithic artifact. There is, however, no evidence to show that more advanced Lower Palaeolithic strains passed north of the Humber during the next (Riss–Würm) interglacial period. But a flake-implement of early Middle Palaeolithic type, from a boulder clay near Whitby, is possibly referable to this phase. If man in those remote stages of his cultural development, and Pleistocene animals associated with him, ranged farther north, their remains could hardly have escaped destruction by subsequent ice-movements initiated in the mountains of the north.

2. So far as the archaeology of Scotland is concerned the most important Pleistocene ice-movements are denoted by two boulder clays revealed mainly in the central part of the country south of the Forth. The lower boulder clay registers the devastating advance which presumably destroyed the records of previous glaciations. This great expansion of the ice is correlated with the Warthe and concomitant advances impelled from Scandinavia, and with the first Würm maximum in the Alps during the fourth glaciation. The upper boulder clay registers the New Drift which once more entirely shrouded Scotland by ice-sheets. These reached as far south as Yorkshire, mantled most of Wales and Ireland, and were in contact with Scandinavian ice-streams along the east coast. This complex, corresponding to the Weichsel advance over north Germany and to the second Würm

extension of the Alpine glaciers, belonged to the last general recrudescence of the Pleistocene ice in Europe.

Locally the two principal boulder clays of Scotland are separated by sediments which record a period of climatic improvement. This period, taken as the datum for correlations of the late Pleistocene, agreed with the Laufen shrinking of the Alpine ice. Early representatives of *Homo sapiens* developed at that time the Aurignacian expression of Upper Palaeolithic culture in what are now France and England. Until then Britain was in the main but an extension of the Continent.

The Aurignacians eventually superseded the late Middle Palaeolithic people and their Mousterian and Levalloisian industries, the most northerly of which have been identified along the Yorkshire bank of the Humber. Congenial conditions then lasted long enough for human bands to reach North Wales, Flamborough Head, and possibly Nidderdale, and for the mammoth, woolly rhinoceros, and reindeer to gain central Scotland south of the Forth. In that region the remains of these animals have been found in the beds between the two boulder clays.

Thereafter in England a native Upper Palaeolithic culture developed outside the bounds of the New Drift. Following that glaciation virtually all mammalian life was for long confined to this territory. This culture, which is called Creswellian, and which had its roots in the Aurignacian of the Continent, grew contemporaneously with the French Magdalenian, and attained its full development as the New Drift ice melted back. Its industries —mainly of blade implements—are best represented at the type-sites in the Creswell ravine, in north-east Derbyshire.

3. In Britain, as in other parts of Europe, pauses and even readvances of the ice broke up the great thaw into periods of retreat. The first and second retreats belonged to Late-Glacial times; the third inaugurated the Post-Glacial period, and witnessed the passing of the Palaeolithic into the Mesolithic Age of man's cultural development in Britain.

The waning of the ice in northern Europe released immense volumes of melt-water. Partly owing to this, the fringes of the land around the ice-centres came to be submerged. The considerable inroads which were made in central and southern Scotland by the Late-Glacial cold sea are registered by the so-called 100-foot raised beach or platform, which actually attains a maximum elevation of over 150 feet in the Highland area and decreases from the centre outwards.

The land eventually recovered from the Late-Glacial submergence, until during the third period of retreat Britain was once more united to the Continent and in partial connexion with Ireland. At this time, on the extended maritime tracts, there were formed the now submerged forests, remains of which are exposed locally at low tide on the Scottish coasts. Along these the stages of land recovery are recorded by strand-lines, the most prominent being about 75 and 50 feet above O.D. around the Highlands; from this centre outwards their elevation decreases.

The sea regained its mastery. Rapidly drowning the territory reclaimed during the preceding emergence, it transgressed the shores and enlarged the firths. Its invasions in Scotland are registered by the Early Post-Glacial, the so-called 25-foot, raised beach, and by the carse-lands of the greater estuaries. Locally banked against a characteristic cave-perforated cliff, this beach attains a maximum elevation of about 50 feet in the central Highland area, and decreases outward like its Late-Glacial predecessor. Its equivalent appears in Northern Ireland and in the north of England.

Eventually the land recovered to approximately its present height relative to the sea. Since then there have been minor intermittent sinkings and uplifts.

Very similar changes of relationship between the land and water are recorded in the Baltic depression, which was twice occupied by a lake and twice by a sea.

4. Pollen-analysis of peats indicates that in Scotland and in the Baltic area a similar sequence of changes in climate and vegetation attended the deglaciation and the different land movements.

The transition from Late-Glacial to Early Post-Glacial was covered by the Pre-Boreal phase. Its cold and damp conditions witnessed the uplifting of the land following the transgression of the icy sea. It also saw the development of an arctic flora and the gradual replacement of this by willow and pine. The peak of the emergence took place during the succeeding Boreal phase, which marked the opening of Post-Glacial time in north-western Europe. Dry conditions over a greatly extended continental plain then encouraged the growth of birch and hazel besides pine. As the temperature rose to maximum and the climate to optimum during the following Atlantic phase, the spread of oak, elm, and lime took place. Under the warm, damp, oceanic conditions, induced by the full development of the Early Post-Glacial sea, deforestation began soon after the commencement of this phase and peat was formed. The succeeding Sub-Boreal phase, by the beginning of which the land had recovered almost to its present height relative to the sea, saw a reduced growth of new forests over parts of the Scottish mainland, and the laying down of sand-dunes upon the raised beach. The subsequent, and mainly wet, Sub-Atlantic phase, which has continued to the present, has seen the forming of peat to the detriment of the woodlands, and minor changes of relationship between the land and sea.

5. The count of laminated sediments, or varves, laid down in areas progressively vacated by the ice in Sweden, provides a time-scale for Late-Glacial and Early Post-Glacial events. It is reasonable to suppose that these were fairly synchronous in the Baltic region and the British Isles. The beginnings of the climatic phases have been estimated thus: Pre-Boreal 7800 B.C.; Boreal (opening of Post-Glacial time) 6800 B.C.; Atlantic 5000 B.C.; Sub-Boreal 2500 B.C.; Sub-Atlantic 850 B.C.

Such marine and terrestrial faunal remains as have been found stratified in Late-Glacial and Early Post-Glacial deposits in Scotland demonstrate that the succession of living forms which are represented are in accordance with the climatic order.

From all this it is evident that the Early Post-Glacial raised beach and its equivalents are of Atlantic age, between 5000 and 2500 B.C., and equatable with the deposits of the Litorina Sea of the Baltic region. This is important to archaeology because the earliest known relics of man in Scotland occur in this formation and in the carse-clays.

6. During the first period of retreat from the front of the New Drift a few animals, of the characteristic species associated with late Upper Palaeolithic man, reached the southern part of the English Lake District, and Creswellian hunters penetrated as far north as Settle in Ribblesdale.

An extension of the migration of these animals during the second and much interrupted withdrawal is indicated by reindeer remains found with arctic molluscan shells near Loch Lomond. As the Late-Glacial sea declined, the natural stocking of Scotland may be said to have begun. Heralded by the arrival of several hardy forms represented by bones in the sediments of old glacial lakes near Edinburgh, it was probably completed during the period of emergence equated with the Boreal climatic phase, when the woodlands were developing.

2. THE ANTIQUITY OF MAN IN SCOTLAND

1. Although nothing shows that Palaeolithic man ever lived in Scotland, yet he may have been present here while Britain was an extension of the Continent, and enjoying genial climatic conditions during the earlier or lower stages of his cultural development.

It is just possible that he could, but hardly probable that he did, gain southern and central Scotland while he was in the final stages of Middle and the first stages of Upper Palaeolithic culture.

That late Upper Palaeolithic man could have reached Scotland during the first and second retreats of the New Drift seems ruled out for the following reasons:

(*a*) No Creswellian traces have been found beyond west Yorkshire, where scanty relics of a bone industry are assignable at the earliest to the first retreat. By the second retreat the Creswellian industries were developed, and by the third they had decayed like those of the contemporary Magdalenian of the Continent.

(*b*) The utterly inhospitable conditions which prevailed during these earlier phases of the general deglaciation would be adverse to the immigration of late Upper Palaeolithic man into Scotland. This country was then girt by a high-level arctic sea, and riven by ice-laden, swollen estuaries and fjords. In lowland areas it was cumbered by lakes of dead ice, flooded by icy torrents and piled with hummocked slush; its high grounds still fed great glaciers. That the conditions would be intolerable to man is also indicated by the scarcity of the remains of even the hardiest animals referable to the late stages of this interrupted spell of deglaciation. This fact is also shown by the character of the retreat deposits.

(*c*) By the time that climatic conditions had become sufficiently congenial for man, the Palaeolithic Age had drawn to a close, and a new age had opened. The question of Palaeolithic man's presence in Scotland can be summarized thus: As the British Isles became gradually adjusted to a long era of refrigeration dominated by the northern ice, so the possibility of Palaeolithic man's penetrating into Scotland became correspondingly less.

2. While there is no evidence of man in Scotland during the Quaternary Ice Age or Late-Glacial times, yet his earliest known relics in that country are of Upper Palaeolithic aspect. They are, however, assignable to the

Post-Glacial period when it was already well advanced. These relics are the gear of people whose cultures belonged to the Mesolithic complex of the British Isles, though their economy was that of Palaeolithic or Old Stone Age food-gatherers. They descend from the English Upper Palaeolithic Creswellian, which is of Continental Aurignacian ancestry.

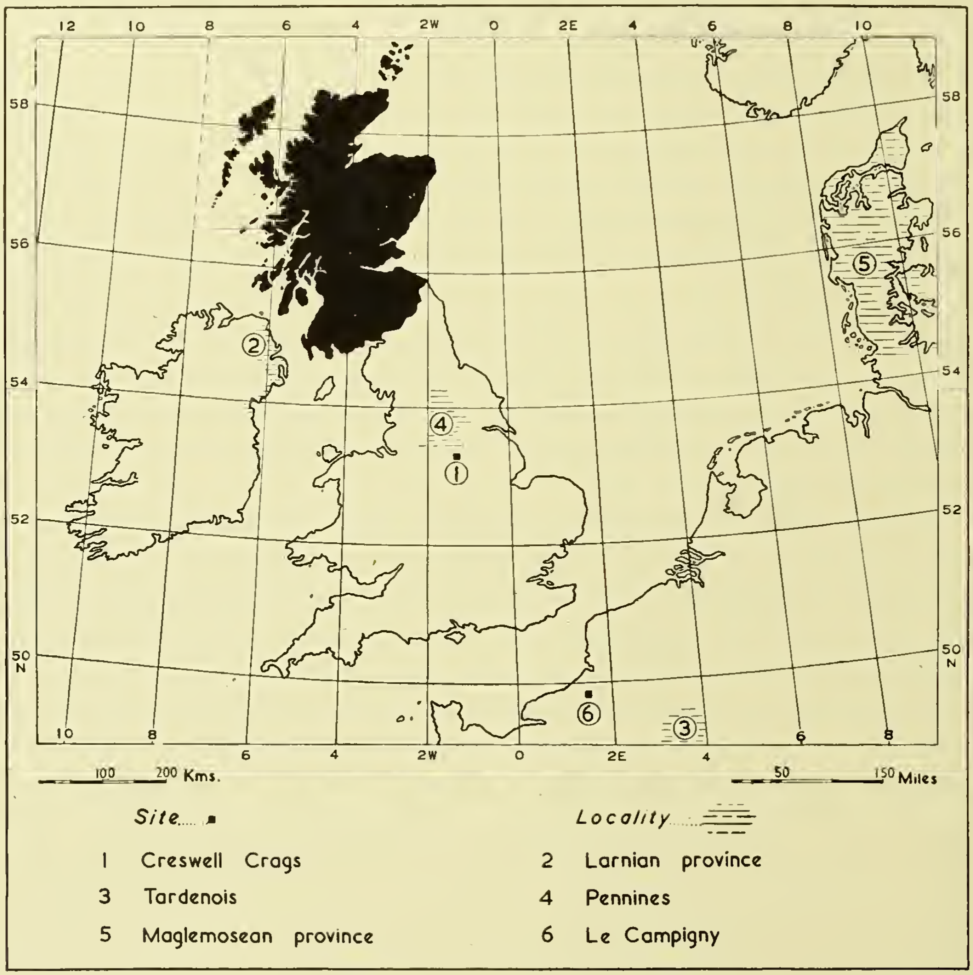

FIG. 140. Map showing Scotland in relation to adjoining lands and shores of the Continent, and the sources contributing to the Scottish Stone Age cultures.

The geographical relationship of the English, Continental, and Irish cultures to the Scottish cultures which are summarized in the following section is illustrated in the map (Fig. 140).

3. THE STONE AGE CULTURES OF SCOTLAND

1. MESOLITHIC. Since the Late-Glacial sea cut off Britain from the Continent, the Creswellian folk could receive no significant reinforcements until the emergence of the sea-floors restored connexions during the Boreal climatic phase. Tardenoisian and Maglemosean strains, respectively from Flanders and Denmark, were then brought by migrants over the enlarged European plain. Before these influences were felt, however, bands of hunters with a debased Creswellian equipment had been moving north-westerly from the North Midlands. Reaching north-east Ireland by way of the extended coastal grounds and partial land-bridges, they developed a culture which was adapted from one of inland hunters to one of strand-loopers. From the type-site this has been called the Larnian culture. It spread to Scotland at the very end of the Boreal climatic phase, or just before the land-sinking of the succeeding Atlantic phase had made much progress. Its earliest expression is identical with that of Ulster, and has, like its Irish counterpart, been found incorporated in the Early Post-Glacial raised beach. In Kintyre and Carrick, respectively at Dalaruan–Millknowe, Campbeltown, and Ballantrae, its flint industries constitute the earliest unambiguous evidence of man in the country.

2. A facies of surviving and later Creswellian, reinforced by Tardenoisian elements, was also borne northward, but on the east side of the Pennines. As a growing Mesolithic culture it reached the coast of Northumberland. By Atlantic times it had become established in the valley of the Tweed, where it was strengthened by a few forms suggestive of Baltic Maglemosean origin. The hybrid industries of the riparian food-collectors, which developed in the south-east of Scotland, are regarded as the inland equivalent of those of the coastal Larnian of the south-west. Long-enduring, the facies absorbed many types of stone implements and seems to have spread widely. It has parallels on the banks of lakes and rivers in the drainages of the Atlantic Ocean and North Sea, and also in sandy coastal areas. An extension westward quite early during the Atlantic climatic phase, most probably through the Biggar Gap, is indicated by some stone industries in Clydesdale, and by the output of an advanced Early Larnian industry at Albyn Distillery, Campbeltown.

3. Tools fashioned in red deer antler—mostly associated with the bones of whales—which have been recovered from the estuarine carse-clays around

Stirling, prove that by Early Atlantic times Maglemosean strains had spread by way of the coastal fens far beyond the principal area of settlement in what is now east Yorkshire. Shell-refuse from deposits on the south bank of the Firth of Forth, which register the Early Post-Glacial marine transgression, may belong to the same phase of migration. Further, some flint implements from gravels of the contemporary formation in the Firth of Tay, near Dundee, should belong to the same complex.

4. Whereas little can be said of Mesolithic developments in connexion with the memorials of the Early Post-Glacial sea on the east side of Scotland, two facies have been recognized on the Atlantic seaboard.

One, identifiable with the Late Larnian of Ulster, is represented by flint artifacts which are much wave-rolled and deeply patinated. These have been taken from the upper part of the Early Post-Glacial raised beach at various points on the shores of the Firths of Solway and of Clyde. Similar objects, found sporadically on the west coasts and on some islands, probably indicate that Larnian strains were carried northward throughout the Atlantic climatic phase.

The other facies, which has been called Obanian after a cave at Oban, is familiar by frequent allusions to its bone and antler implements. Among the chisel-like tools and barbed points which are characteristic of it, several evince definite Baltic traditions. In its stone industries, mainly flint and quartz, there appear all the cultural influences, but principally Larnian, which reached Scotland during the Atlantic climatic phase.

Stone implements, flaked in Maglemosean style, from Luss parish, Dunbartonshire, suggest that one of the routes by which traditions of Baltic Forest cultures passed from east to west beyond Stirling was up the valley of the Forth and then by the Loch Lomond drainage.

The Obanian industrial products and the containing refuse of occupation present evidence of the mode of life of the settlers. Molluscan shells, remains of fishes, birds, marine and land mammals indicate food-gathering on the foreshore and the rocks, supplemented by fishing, fowling, and hunting.

A considerable interval separated the Obanian industries from those Mesolithic relics yielded by the Early Post-Glacial raised beach and the carse-clays. Even the earliest Obanian relics cannot be anterior to the Late Atlantic climatic phase, for the implementiferous materials from caves opening behind the raised beach, and the kitchen-middens resting upon it, were accumulated only after the re-elevation of the land had begun. The

Obanian culture lasted a long time, certainly far into the Sub-Boreal climatic phase in the remote west. It seems to have had equivalents which covered the same time range on other coasts—for instance in the North Sea basin, where rude industries recovered from shell-middens and caves must be derived from those which had entered the eastern side of the country early in the Atlantic phase.

5. EPIMESOLITHIC. By the end of the Atlantic or beginning of the Sub-Boreal climatic phase (*c.* 2500 B.C.) heralding elements of Neolithic culture were reaching north-east Ireland. One element has been held to represent an extension of the Mesolithic tradition as typified in the Campignian facies of the Early Neolithic of western Europe. About the time when the re-elevation of the land was almost complete, this culture had, at least locally, superseded the coastal native Larnian. Occurring in the humus resting upon the Early Post-Glacial raised beach, its relics have been recognized at Ballantrae, Ayrshire, in the same conditions as in Ulster. The Scottish assemblages are, however, more comprehensive than the Irish. Besides the typical *tranchets* and their derivatives, they include an important strengthening of narrow-blade non-geometric forms made by Tardenoisian micro-burin technique. Nowhere does this facies of industry include pottery, and, so far, ground stone tools appear only very late in north-east Ireland. The exponents of this industry were food-gatherers like their Larnian predecessors, many of whose favourite implement-forms they continued to produce. Hence, though coeval with the English Neolithic, the new littoral culture of the Hiberno-Scottish province may fittingly be called epimesolithic.

This term is equally applicable to the industries of succeeding generations of food-gatherers who spread far and lived after the manner of their Old Stone Age ancestors, notably at sandy sites along the coasts on the mainland and islands of Scotland. Such groups preserved many of the Mesolithic industrial traditions which had reached Ireland and Scotland, and which from Boreal to Sub-Boreal times had gone to the building of the earliest known native cultures. They came into contact with more advanced invaders, from whom they appear to have copied many tools, weapons, and even some crafts, though without ceasing to manufacture ancient types. This fact is everywhere clearly shown, but particularly in those industries which included microliths in their output.

The evidence of artifacts and other considerations show that there was little connexion between the primitive food-collectors and the settlers who practised agriculture and expressed religious ideas in megalithic structures. As in so many parts of the British Isles, the links were with the exponents of early metal culture, whose first colonizing waves descended on the shores of the North Sea as the tomb-builders were settling in the south-west and making their way northward along the west coasts. From these meetings they profited much, especially by acquiring elements which were helpful in the food-gathering quest. This association with the more mobile Beaker folk is understandable, because the crop-raisers and stock-breeders would shun the very regions which were the most attractive to the food-gatherers. In such an environment a developed food-producing economy could hardly have arisen, and far less have thrived. This statement conforms with the view that the true and full Neolithic culture was localized and short-lived in the British Isles,[1] and that in Scotland, owing to local peculiarities, it was restricted to certain aspects. To small longshore societies, however, the sand-dunes and their surroundings afforded ample subsistence, obtainable with little effort. Here, then, they persisted until absorption occurred, or until they themselves took to food-production, which locally may not have been before the Christian era, if we can rightly judge from the testimony of the sand-hills. Yet it is less remarkable that evidence of this retardation should appear in remote islands on the outermost edge of north-western Europe than at mainland sites.

All these industries of manifestly backward communities, from the sand-dunes and from a number of caves and rock-shelters in Scotland, belong to a low culture-complex that is well represented in similar conditions along the coasts of the British Isles. Over this vast stretch there were local but not necessarily synchronous variations. Such were the rise of different facies and the inclusion of reinforcing elements in response to regional conditions and requirements. Of special interest, therefore, are these growths, contacts, and assimilations which from Sub-Boreal times onward took place on the Scottish seaboard. They involve the long-persisting Mesolithic cultures, the industries of which were developing during the preceding Atlantic climatic phase, and which furnish in their vestiges the earliest known evidence of man in Scotland. The circumstances of discovery, the distribution, and the character of these remains illustrate the

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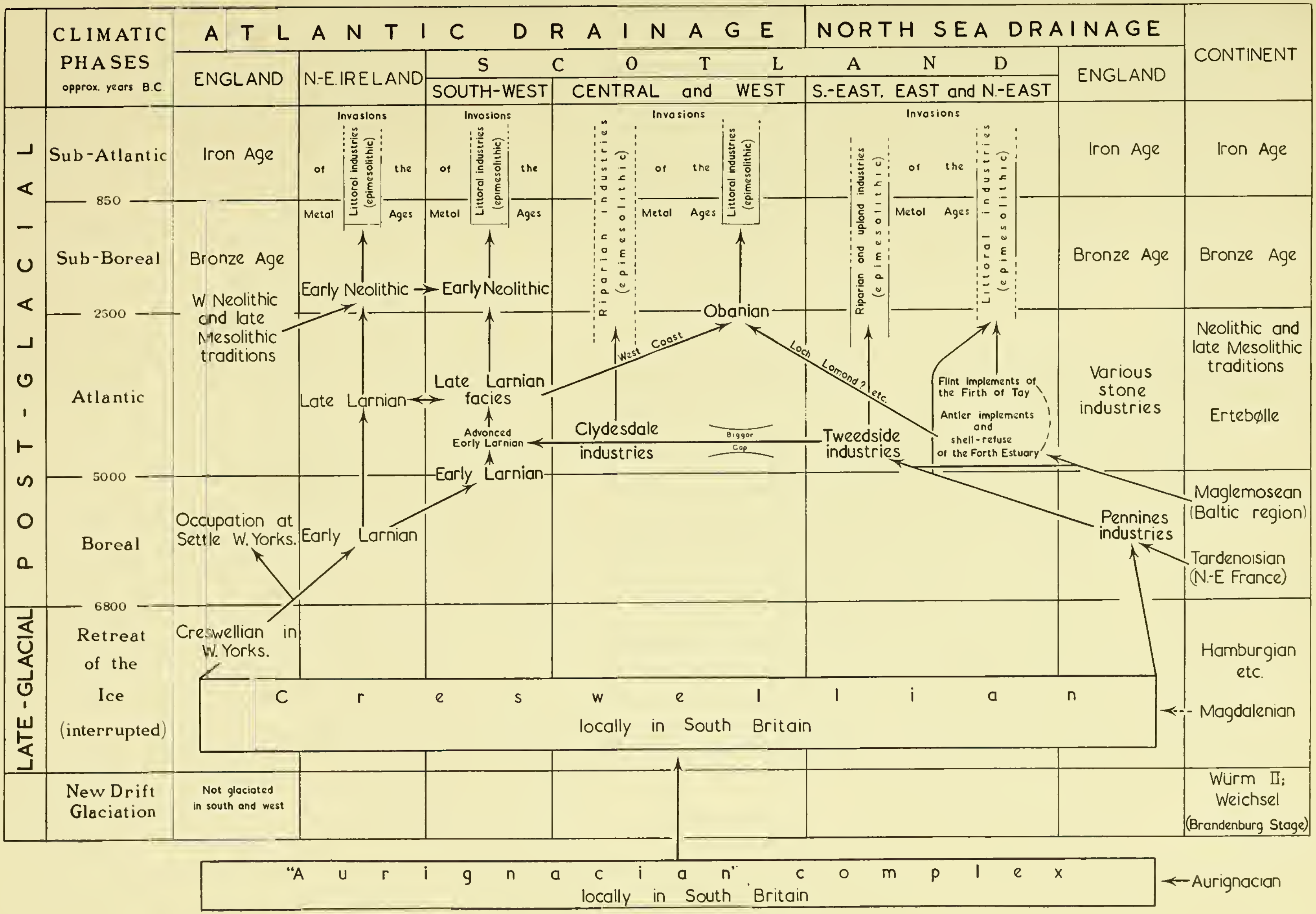
[1] Clark, 1932, p. 96.

TABLE VI

A tentative chronology of the Stone Age cultures of Scotland.


CLIMATIC PHASES
approx. years B.C.
ATLANTIC DRAINAGE
NORTH SEA DRAINAGE
CONTINENT
ENGLAND
N.-E. IRELAND
SCOTLAND
SOUTH-WEST
CENTRAL and WEST
S.-EAST, EAST and N.-EAST
ENGLAND
POST-GLACIAL
LATE-GLACIAL
Sub-Atlantic
850
Sub-Boreal
2500
Atlantic
5000
Boreal
6800
Retreat of the Ice (interrupted)
New Drift Glaciation
Iron Age
Bronze Age
W. Neolithic and late Mesolithic traditions
Occupation at Settle W. Yorks.
Creswellian in W. Yorks.
Not glaciated in south and west
Invasions of the Metal Ages
Littoral industries (epimesolithic)
Early Neolithic
Late Larnian
Early Larnian
Late Larnian facies
Advanced Early Larnian
Early Larnian
Riparian industries (epimesolithic)
Obanian
West Coast
Clydesdale industries
Biggar Gap
Loch Lomond? etc.
Riparian and upland industries (epimesolithic)
Littoral industries (epimesolithic)
Tweedside industries
Flint implements of the Firth of Tay
Antler implements and shell-refuse of the Forth Estuary
Iron Age
Bronze Age
Various stone industries
Pennines industries
Iron Age
Bronze Age
Neolithic and late Mesolithic traditions
Ertebølle
Maglemosean (Baltic region)
Tardenoisian (N.-E France)
Hamburgian etc.
Magdalenian
Würm II; Weichsel (Brandenburg Stage)
Creswellian locally in South Britain
"Aurignacian" complex locally in South Britain
Aurignacian

delayed access and spread of the various cultural strains from outside the bounds of the last great advance of the Pleistocene ice-sheets, of which the New Drift of the British Isles forms the background of this study.

4. EPILOGUE

We have seen how Scotland was prepared for man by the deglaciation and its attendant changes. We can therefore better assess the relics of her primordial colonists and those of so many of their successors, who in isolated regions persisted in an economy little different from that of the Old Stone Age. This study is but the prelude to this field of inquiry which affords unlimited scope for future researches. These, it may be hoped, will refine and correct many observations advanced in this attempt to bring the industries of the food-gatherers of Scotland into the framework of European prehistory (Table VI, p. 315). That something has already been achieved to suggest the methods of further investigations is due to collaboration of the archaeologist with the geologist, the botanist, and the zoologist. True, the results of this concerted work demonstrate that Scotland has no record of human occupation comparable to that of lands south of the New Drift and its correlative movements. They prove, however, that the Stone Age in Scotland, even as exemplified in Mesolithic industries, ranged over a period infinitely longer than the remainder of prehistoric and historic time in that country.

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